

THE Malayan Agricultural Journal.

OCTOBER, 1932.

EDITORIAL.

The Inter-Departmental Conference 1932.

Since the early days of rubber planting in Malaya, various authorities have drawn attention to the danger of allowing the agricultural prosperity of the country to depend almost entirely on one product. In spite of the danger foreseen by so many and especially in view of the warning note which was struck by the incidence of a rice shortage in 1920, which, as His Excellency the Governor reminded us in his recent speech at the Malayan Exhibition, cost the Government alone \$40,000,000., the country still remains vulnerable to a repetition of similar or worse conditions.

The experience of the past in the matter of food shortage was largely overlooked, because of the satisfactory profits obtained from the cultivation of the rubber tree. Instead of re-organising agriculture in Malaya, further areas of land were opened up for rubber cultivation—which may be regarded as highly justifiable development—but without the safeguard of ensuring future food supplies or the alternative crops which might assist in tiding over any depression in the chief agricultural industry.

In both Java and the Philippines, the Governments have for many years encouraged the local production of rice and other food crops and to-day these countries are largely independent of supplies from abroad, so that although their main export industries are depressed, the condition of the peasantry is markedly better in many respects than is the case in Malaya. Incidentally, it is observable that in those districts of this Peninsula which are self-supporting in the matter of rice production the prevailing distress is considerably less acute than elsewhere.

An Inter-Departmental Conference was held in Kuala Lumpur during the first week of August, 1932, with the object of examining the present position and considering measures tending to ameliorate the lot of the raiat in the present period of distress by encouraging the extension and improvement of certain crops and by increasing the production of the area under foodstuffs.

The question of providing suitable marketing channels for peasant produce is a matter of difficulty, especially in a country like Malaya where certain types of produce have to compete with imported articles of which the distribution has

long been organised, and where, in addition, the small-holders are often exploited by rings and combines of middlemen. If progress is to be achieved the provision of better marketing facilities appears to be of vital importance. This and other economic questions were discussed at length during the Conference, in addition to matters relating to the purely agricultural side of the problems relating to the industries under consideration.

The importance at the present time of Chinese agriculture in Malaya in relation to the supply of vegetables and fruit is perhaps not fully realised, nor what the effect would be if for any reason the supply of these commodities was seriously curtailed.

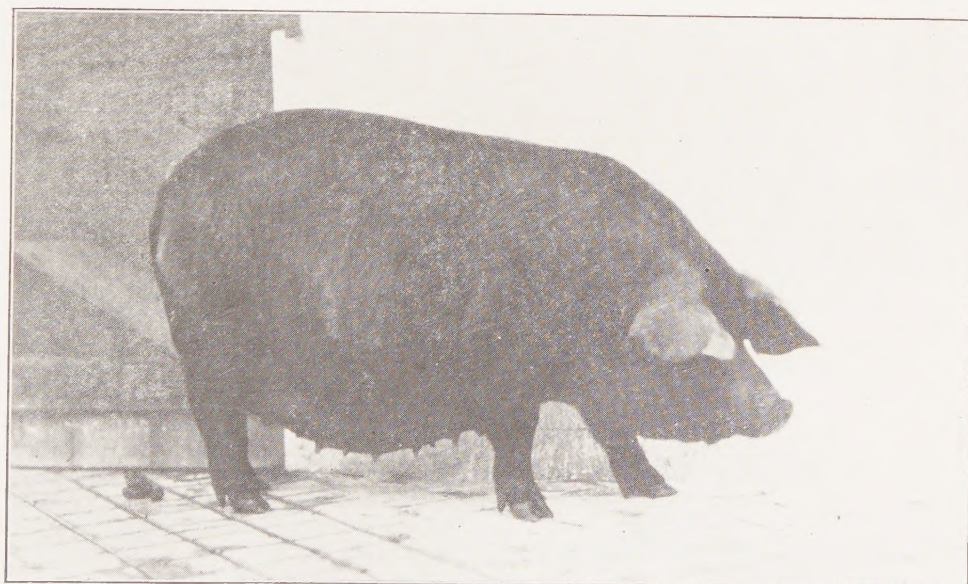
The Department of Agriculture has of recent years obtained an amount of information regarding agriculture on Chinese small holdings through the Chinese Sub-Inspectors of Agriculture, and has been able to inaugurate experimental work with a view to investigating the possibility of changing the rather objectionable manuring practise adopted by Chinese market gardeners.

This question also received attention during one session of the Conference, as well as questions relating to land alienation, pig farming, and tea growing amongst Chinese small-holders.

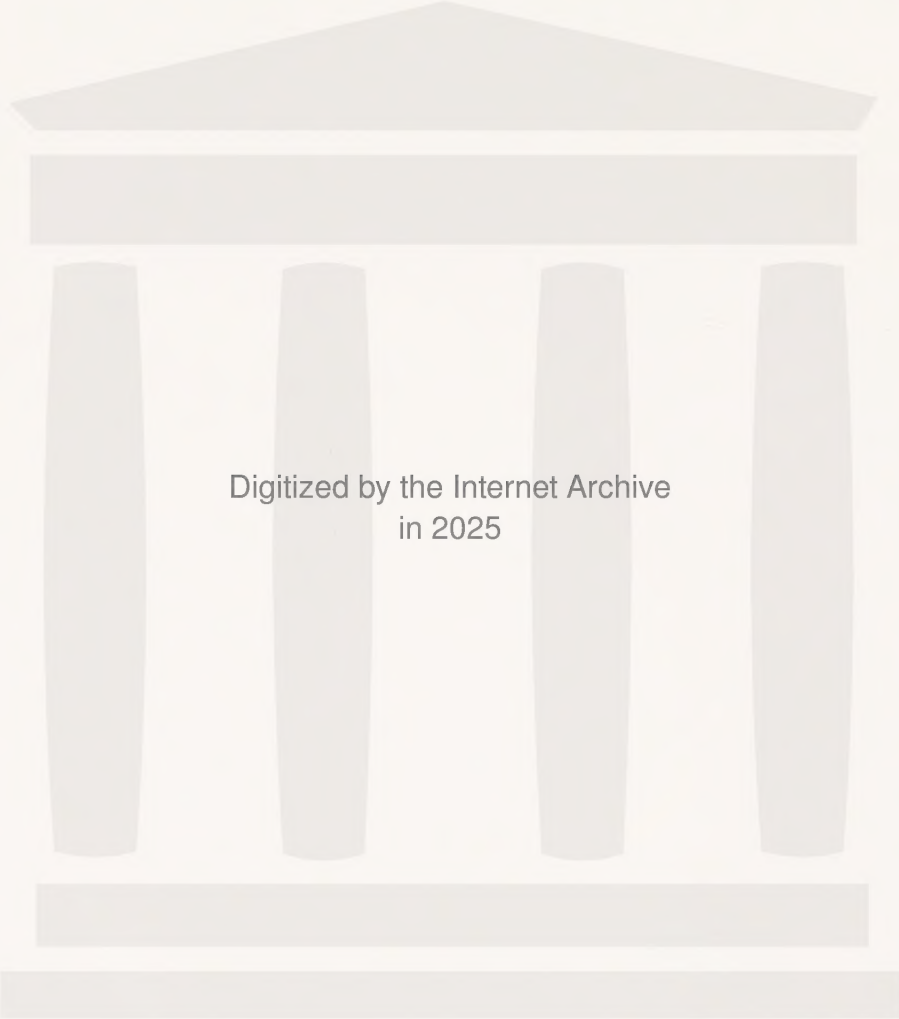
The Conference, an account of which appears in the present number of this journal, was fruitful of many results and has undoubtedly been a step in the right direction. It should result not only in an appreciation of the difficulties common to each branch of the executive and administrative services represented, but in closer liaison between them towards the object of improving and encouraging the wider scope of agriculture advocated.



LARGE BLACK BOAR.
Nine months old.



LARGE BLACK SOW.
Pregnant, twelve months old.



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Original Articles.

THE PIG FARM AT SERDANG

BY

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The objects of this branch of the Stock Farm are, primarily, to maintain animals of European breeds to ascertain their suitability to the conditions prevailing in Malaya.

Secondly, to multiply the animals of the suitable breeds for distribution throughout the Peninsula with a view to the improvement of local pigs by cross-breeding with the imported breeds, and thirdly, to demonstrate to breeders that an improvement in the type of the local pigs can be accomplished by crossing with animals of the European breeds.

As it was proposed to inaugurate feeding experiments, in the first instance rations were arranged to test the suitability of foods not commonly used in Malaya, and to educate the local breeders on the necessity of feeding minerals.

Owing to the limited and temporary accommodation of the piggery, and insufficiency of funds, it has not been possible to conduct close research on feeding, and the results obtained, therefore, have mostly been based on observations.

The pig farm was commenced in a small way at the beginning of 1929 by the importation of the following pigs from Hong Kong,—two Large Black boars, two Large Black sows, two Middle White boars, and two Middle White sows.

These pigs were about nine months old when received. The cost was \$75 each, free on board, Hong Kong. The addition of shipping charges, insurance, crates and agency fees increased the figure to \$87 per head.

Four typical Chinese gilts of two distinct types were purchased for breeding experiments at a cost of \$21 per head.

A temporary shed 60 ft. x 30 ft. to house these animals was built of round jungle timber with an attap roof, having open sides and ends, and with a central passage running lengthwise. The building contained twelve styes, four of which were larger than the others for farrowing pens. The floor was gravel with a fairly steep slope. Partition walls were of round jungle timber placed adjoining each other vertically, and about four feet high. The cost of the building was \$270.

Feeding Troughs.

Arrangements were made with an earthenware pipe manufacturer to supply half-section glazed pipes in two feet lengths and in two sizes, 8 inches and 12 inches in diameter, without socketed ends. These pipes were moulded into blocks of cement concrete, so that they formed the lining of the troughs.

The troughs were hygienic, cheap, and fairly heavy. They were constructed

with a drain hole at one end and fitted with a wooden plug to facilitate cleaning operations. The advantage of the glazed linings over ordinary concrete is that the latter is porous and liable to become sour.

A temporary bathing tank was built of cement concrete in a water course near the piggery. It was about 5 feet wide and 15 feet long, consisting of side walls with a ramp leading to the bath. The height of the water is controlled by inserting a lesser or greater number of hardwood planks in vertical grooves in the side walls and across the outlet. The cost of this tank, including labour and materials, was about \$20.

Recently, an up-to-date piggery has been constructed 64 feet long and 28 feet wide with a framework of hardwood posts, asbestos cement sheets being used as a roofing material. This building contains 12 pens, 10 ft. x 7 ft. 6 ins. and two larger pens for brood sows of 10 ft. x 15 ft.

Outside walls to a height of 5 feet and all internal partition walls are constructed of one course of bricks with a cement concrete rendering on all sides.

From the top of the outside walls to the eaves which are $7\frac{1}{2}$ feet high is expanded metal.

There is a door leading from each sty to an outside yard.

All the pens adjoin a central passage running from end to end of the building. The floor of the sleeping portion of each pen is raised about two inches higher than the general level of the sty floor, the floors are crossed with grooves about one half inch deep, at intervals of about 6 inches, to prevent the animals from slipping, and a fall of 1 in 100 is allowed with the slope towards a drain constructed along each side of the central passage.

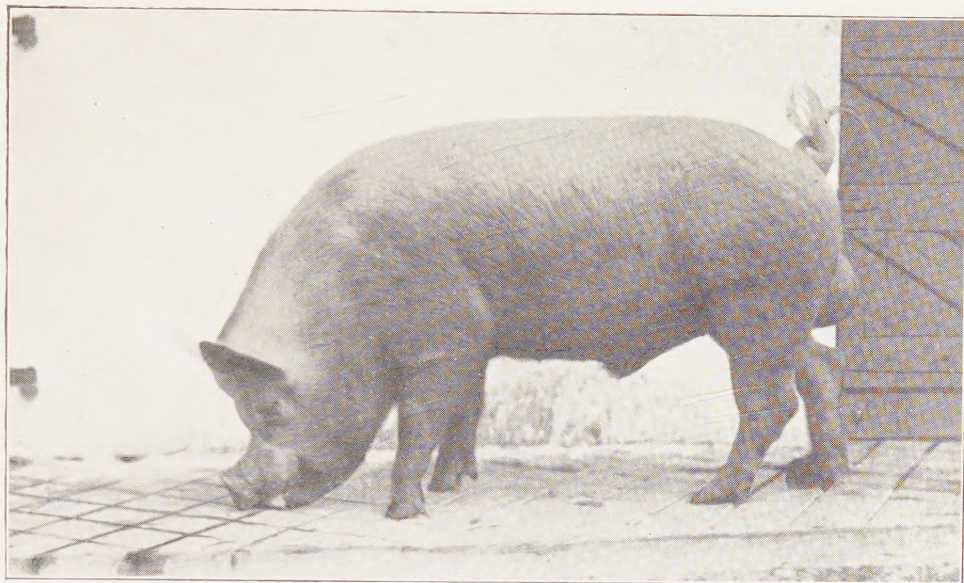
The feeding troughs are arranged along each side of the central passage, and are constructed of iron. They have a vertical swing shutter hinged along the top horizontal edge, which, when required, will shut the pigs away from the trough whilst it is being cleaned, or food is being supplied.

The drainage system of the pens ordinarily conducts the urine into a tank outside the building, a bye-pass being constructed to allow water used in washing the pens to flow into the rain-water drains.

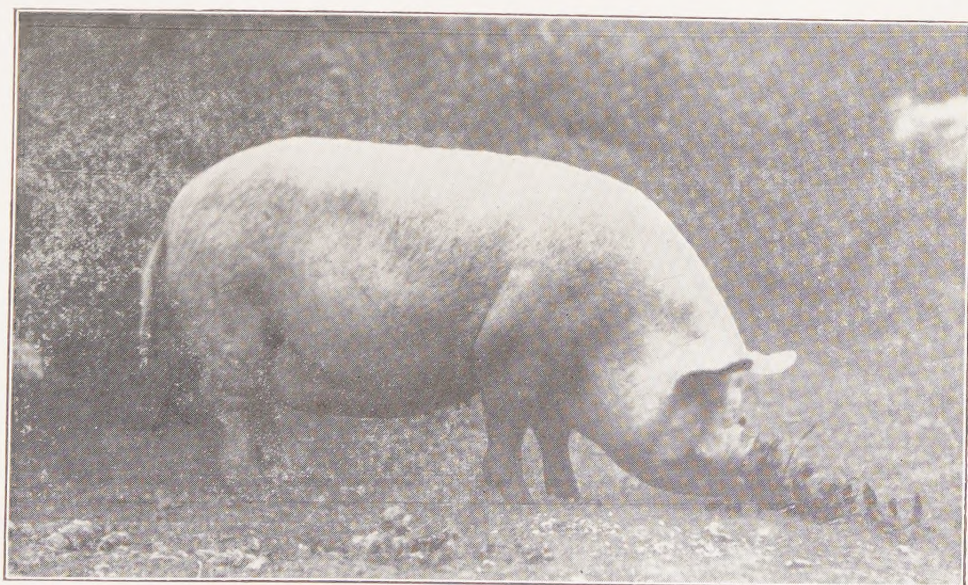
The cost of this piggery was \$1,500, to which must be added the cost of the 14 iron doors and troughs which were imported from England, at a landed cost of \$1,220.

This piggery has been erected as a model type, with a view to the hygienic principles involved. Temporary styes, having cracks and crevices throughout, harbour both internal and external parasites. The styes are built mainly of concrete and iron and offer no shelter for parasites in any stage of their life history. They have been constructed to maintain a high degree of cleanliness and will give a greater control of the animals and facilitate the inauguration of feeding trials.

The experience gained at Serdang shows that pigs of the Middle White and Large Black breeds are suited to tropical conditions provided they are not unduly exposed to the sun and they are protected from the attacks of disease



MIDDLE WHITE BOAR.



MIDDLE WHITE SOW.

and parasites. Two of the original importations from Hong Kong succumbed to liver and lung worms. It might be preferable to import pigs from a temperate climate as they would be less liable to be infected with the parasites or diseases that chiefly flourish in the tropics; on the other hand, they may be more susceptible to tropical diseases and parasites.

Conversely, pigs that have been acclimatised to the tropics or sub-tropics for a few generations and have been kept under hygienic conditions and maintained in a healthy state, would be less liable to suffer from the effects of the heat if transferred from one tropical country to another. Furthermore, such animals might have developed a certain immunity to tropical diseases.

The experience gained to date is insufficient to prove whether pigs of European breeds that are maintained pure for a few generations lose any vigour through their stay in the tropics. As pigs breed and mature very quickly it is imperative that new strains be introduced periodically to prevent inbreeding, this necessary practice also maintaining the vigour of the herd.

With healthy vigorous stock, a limited amount of inbreeding is permissible. Care should, however, be taken to select robust animals and the practice must not be carried too far. There has been a greater demand for pigs of the Middle White breed than those of the Large Black, and new importations of stud stock of the former breed are now being made to prevent inbreeding of the present stock.

With regard to the Large Black breed, the farm was fortunate in being presented with two pedigree Large Black boars by Mr. W. F. Zehnder of Malacca. The progeny of these boars is an improvement in type in comparison with those sired by the original imported boars.

Since the commencement of the Pig Farm the number of pigs sold for breeding purposes, exclusive of those slaughtered for pork, is 75. This number includes selected cross-bred animals out of Chinese sows and sired by boars of the Middle White and Large Black breeds.

The table hereunder gives the distribution of the pigs to the various States in Malaya :—

Table Showing the Distribution of Breeding Stock from the
Government Stock Farm, Serdang, between
August, 1929 to August, 1932.

STATES.		Middle White.	Large Black.	Cross-bred.
Perak	...	5	3	4
Selangor	...	14	3	5
Negri Sembilan	...	2	—	—
Pahang	...	1	3	13
Penang and Province				
Wellesley	...	2	2	8
Singapore	...	—	1	3
Johore	...	4	2	0
Totals	...	28	14	33

Owing to the limited accommodation available, breeding experiments with Chinese sows and boars of European breeds have only been carried to the first generation. The type of cross-bred produced is far superior to the mature local sows. These animals have a straight top line, they stand erect on their fetlocks, and the pigs of each cross mature much earlier than the local pigs; they are notably uniform in type and they take most of their characteristics from the sire, even to colour. It is anticipated that the quarter-bred pigs would result in a further improvement in type and conformation; there would be very little reversion in individuals to the Chinese type owing to the prepotency of the sire.

Should cross-bred boars be mated to cross-bred sows there is little doubt that the resultant progeny would vary considerably in type and colour.

Minerals.

The excellent type of pigs produced in the first crosses may not be all attributable to the influence of the sire, it is necessary to mention that the animals are fed on balanced rations with the addition of ample mineral salts. It is considered that most of the live stock reared in Malaya suffer from a deficiency of minerals in their food.

Feeding.

Some rations that are fed at Serdang are given hereunder, from which other balanced mixtures may be prepared according to the prices and their availability in the market. Grass should be given freely, but the appropriate allowance required is given below :—

(a) Young Pigs up to 4 months old.

Vegetables or young grass per head	...	5	lbs.
Rice bran	...	20	„
Coconut cake	...	2	„
Soya bran cake	...	10	„
Crushed gram	...	5	„
Minerals	...	$\frac{1}{2}$	lb.

This mixture should be fed at the rate of $4\frac{1}{2}$ to 5 lbs. per picul of live weight per day.

(b) Growing or Fattening Pigs from 4 to 6 months old.

Vegetables or young grass	...	10	lbs.
Rice bran or Maize	...	18	„
Coconut cake	...	4	„
Soya bean cake	...	4	„
Crushed gram or gingelly cake	...	4	„
Minerals	...	$\frac{1}{2}$	lb.

Allow about 4 to 5 lbs. of the mixture per picul of live weight per day.



TYPICAL CHINESE SOW OF THE PIEBALD TYPE.



TWO TYPICAL CROSS-BRED GILTS.

Out of Chinese Piebald Sows:

Left:— Sired by Middle White Boar:

Right:— Sired by Large Black Boar:



TYPICAL CHINESE SOW OF THE ALL BLACK TYPE.



NEW PIGGERY AT THE STOCK FARM, SERDANG.



INTERIOR OF PIGGERY:
Showing feeding troughs.

MATURE PIGS.

Vegetables or grass	... 10—15 lbs.
Rice bran	... 18 "
Soya bean cake	... 4 "
Coconut cake	... 3 "
Crushed gram or gingelly cake	... 3 "
Minerals	... $\frac{1}{2}$ lb.

Allow 1—2 lbs. of the mixtures per picul of live weight per day.

Some Diseases that have occurred at Serdang.

The pigs at the Government Experimental Plantation, Serdang, have suffered from mild attacks of worms on a few occasions.

The first case that occurred was an imported Middle White sow which developed a cough; her litter was infected by the same parasite. This was diagnosed on the post mortem of a weaner as being due to the attacks of the lung worm, *Strongylus paradoxus*, which caused the death of the sow and all her litter. The Government Veterinary Surgeon treated the pigs but without success. Since that time no more pigs have been affected.

As practically all pigs suffer from the effects of intestinal worms, periodic administration of Santonin is given, the drug being administered in doses of 5 to 20 grains according to the size of the animal, followed about half a day later with a mild dose of Epsom salts of $\frac{1}{2}$ to $1\frac{1}{2}$ ozs. per pig.

Carbon tetrachloride is a very effective vermifuge and may be given to pigs in gelatine capsules, after fasting the animals for twelve hours. The dose is one to six drachms according to size of animal.

It has been observed that pigs having a stiffness in the hind quarters, at times almost amounting to paralysis, have responded quickly to treatment by Santonin, indicating that intestinal or kidney worms were causing the sickness.

A case of tuberculosis in an imported stud boar was diagnosed by the Veterinary Surgeon, and the animal destroyed.

A few mild cases of diarrhoea have been noticed in litters when the pigs are between the ages of two and four weeks; this trouble is probably due to bacterial infection. Pigs seldom suffer severely and the bowels become normal after a few days. To prevent the disease, cleanliness in the sty and feeding troughs is essential and it is recommended that the navels of all pigs at birth and again a few days later be painted with tincture of iodine.

Blow flies have been troublesome on a few occasions, egg laying has been observed in the navels of young pigs a few hours after being farrowed and also in the vagina of sows immediately after farrowing.

Nettle rash or urticaria has occurred, it has usually been associated with the feeding of Indian grams and is probably due to digestive troubles. This condition is manifested by small raised lumps on the skin which appear suddenly. A reduction of the highly nitrogenous constituents of the ration with a dose of Epsom salts of 1 to 2 ozs. usually effects a cure.

THE ROTENONE CONTENT OF MALAYAN TUBA ROOT

BY

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Introductory.

Although for many years the fresh roots of certain species of the genus *Derris*, commonly called tuba, have been known to Malays for their toxic effect on fish and to Chinese market gardeners for their value as an insecticide, the general use of the roots in proprietary insecticidal preparations has not developed to the extent that might have been expected in view of their relatively wide local application.

This can be ascribed to various causes, among which may be mentioned the difficulty of obtaining regular supplies of roots of uniform quality, a lack of knowledge concerning the chemical composition of the toxic substances present and the variations found in insecticidal potency.

Recent work by the United States Department of Agriculture (1) (2) regarding the composition and the relative toxicities of various chemical compounds present in the roots has indicated, however, that there are considerable possibilities for tuba root as a general insecticide, provided the roots contain an appreciable proportion of a substance called rotenone, their investigations having shown that towards certain insects rotenone is by far the most potent of the various compounds as yet isolated from the roots.

As a result of the increased interest taken in the commodity, analyses have been made of roots collected from different parts of the country in order to ascertain the extent of the variations in the rotenone contents of consignments of material at present being offered for sale.

In the present paper, therefore, it is proposed first of all to consider the reasons for the lack of development of the industry and then to record the results of the investigation regarding the variations in the rotenone contents from the point of view both of commercial consignments of roots and of samples from different species of *Derris*. In this connection it may be mentioned that an investigation has already been commenced to ascertain the species of *Derris* which will yield the highest proportion of rotenone, the conditions under which the plants must be cultivated and the age at which the roots should be harvested.

The question of the preparation from the roots of an extract for export, thereby saving the heavy charges incidental on the shipment of a product of such a bulky nature as dried roots, will also be mentioned.

Variation in Quality of Root.

As regards the question of variation in quality there is little doubt that the chief causes are the number of different species of *Derris* to be found and the comparative absence of any systematic cultivation resulting in supplies of mixed roots, both of species and age. Further, from the point of view of the commodity itself, the lack of any marked features by which roots of different species can be distinguished and the absence of any chemical standard for comparison must not be overlooked. In this connection, it is well-known that certain manufacturers of insecticides, realising the difficulty of purchasing in the open market sufficient quantities of roots of uniform quality, made special arrangements to ensure their own supplies of a particular species, thus being able to maintain a standardised product.

As stated above, there are several species of the genus *Derris*, for example in a digest of literature (3) published by the United States Department of Agriculture on the subject it is stated that there are no fewer than 40 species and it is not unlikely, therefore, that these will show considerable variations as regards toxic properties. Also, since the use of tuba root as a fish poison has been known to Malays for generations and little systematic cultivation has been carried out with the crop, it is reasonable to suppose that with the large number of species extant consignments of tuba root collected from different sources will probably consist of a mixture of roots. Some of the roots possibly may not even belong to the genus *Derris*, since it is well-known that roots of other plants of similar habits possess similar toxic properties. Further, it has been established that the toxic properties can be correlated both with the age and the size of the root.

While an examination of a mature *Derris* plant should reveal its botanical classification there is no easy means of identifying the species from the dried roots so that, unless the latter can be subjected to analysis, a buyer will always be running a grave risk as regards quality in purchasing roots of unknown origin.

In connection with the question of a chemical standard it may be mentioned that about 9 years ago, following an investigation carried out at the Rothamstead Experimental Station (4) a suggestion was made to value the root on the amount of matter extracted with ether, the genuineness of the extract being confirmed by the determination of its methoxyl content. As far as is known the proposal was never generally accepted, although the amount of ether extract has been used as a standard for comparative purposes in this Department (5) (6) and there is reason to believe that buyers of tuba root have used and do still use the amount of matter extracted by certain solvents as a criterion of the value of the root for insecticidal purposes.

Toxic Substances Present in Roots.

Although, as pointed out by Roark (1), a Japanese chemist, Nagai, as far back as 1902, isolated from the roots of *Derris chinensis* a definite chemical

compound having toxic properties, which was called rotenone, it was not until recent years that any appreciable progress was made as regards the chemical constitution of either rotenone or the other chemical compounds to which roots of the genus *Derris* owe their toxicity. Among these latter may be mentioned deguelin, tephrosin and toxicarol, all of which have been isolated and described by Clark (7) (8).

Further, as regards rotenone it may be mentioned here that as a result of recent work carried out by the United States Department of Agriculture. LaForge and Haller have now assigned a constitutional formula to this compound (9). While it is true that such a step may be regarded as a preliminary to the synthesis of rotenone, the effect of which might be to alter profoundly the chances of the natural product competing successfully with the synthetic, a consideration of the structural formula reveals the fact that synthesis would undoubtedly involve some complex chemical processes, which would materially increase the cost of production.

At this stage, therefore, it may be of interest to record briefly the names, chemical formulae and appearances of the four chemical compounds now known to be present in roots of various *Derris* species.

Name of Compound	Chemical Formula	Melting Point	Appearance
Rotenone	$C_{23}H_{22}O_6$	163°C.	White crystals
Deguelin	$C_{23}H_{22}O_6$	171°C.	Pale green crystals.
Tephrosin	$C_{23}H_{22}O_7$	198°C.	White crystals.
Toxicarol	$C_{23}H_{22}O_7$	219°C.	Yellow crystals.

It will be seen, therefore, that all four compounds are closely related, rotenone and deguelin being isomeric, also tephrosin and toxicarol. Further, the last two compounds only differ from the former by the presence of an additional atom of oxygen.

The relative values of these substances as contact insecticides have been studied by Davidson (10) who found, for example, that towards the bean aphid, *Aphis rumicis*, aqueous suspensions of these four chemical compounds stood in the following ratio:—

Rotenone	Deguelin	Tephrosin	Toxicarol
400	40	10	1

Davidson concluded therefore that the gradation in toxicity of these four chemical compounds formed the clue to the variations in insecticidal potency previously observed in *Derris* root. Further, the results indicated that the rotenone content appeared to be the most satisfactory criterion for measuring the value of a sample of root since, unless occurring in exceptionally large amounts, the other three constituents could not affect substantially the insecticidal potency of the extract.

As a consequence, a proposal has been put forward in the United States of America to grade *Derris* root according to its rotenone content and this is

therefore the aspect from which the results given in this paper must be regarded. The variations in rotenone content are, however, not to be taken as an indication of the relative toxicities of the different species which can only be determined by controlled insecticidal tests.

Method of Analysis.

Before giving the results of the investigation regarding the variations in the rotenone content it is considered advisable to refer briefly to the method of analysis, which is based on that originally described by Roark (1).

The method for the extraction of rotenone depends on its relatively low solubility in ether, 0.4 grammes per 100 c.c. of solution at 20°C., so that separation of the compound from an ethereal solution can be readily effected, especially if the solution is cooled.

It will be realised, however, that since compounds other than rotenone are also extracted by ether and may therefore tend to separate with the rotenone, the method can only be regarded as approximate, although it must be admitted that in the majority of instances the purity of the crude product, judged by its crystalline structure and melting point, is comparatively high. In this connection it may be mentioned that the proportion of the crude rotenone to that of the total ether extract may vary from nil to 33 per cent. This variation in proportion will be referred to later.

It has been found necessary to amend the original method as described by Roark in order to suit local conditions, the modified method being as follows:—

One hundred grammes of the finely ground root are dried in a water-jacketed vacuum drying oven at a temperature of approximately 75°C for 8 hours and completely extracted in a Soxhlet apparatus with ether. The combined extracts are concentrated to a volume of approximately 40 c.c. The flask containing the extract is closed with a cork and placed in the cold cabinet. Either crystallisation proceeds rapidly or the liquid becomes thick and viscous. In the latter case the flask is removed and allowed to stand in the air until the liquid is just mobile again, when it is seeded with a small amount of pure rotenone, approximately 0.05 gramme, and the flask replaced in the cold cabinet. In this way it is possible to effect fairly rapid crystallisation.

The flask is allowed to remain overnight in the cold cabinet, the next morning the crude rotenone is filtered on a tared Gooch crucible, using a paper disc as filter, washed three times with ice-cold ether, 5 c.c. at a time, dried at 100°C. for one hour and weighed.

The method of direct seeding is found to be especially useful in those cases in which the proportion of rotenone is low, for example 2 per cent. and less, and is in our opinion preferable to depending upon a slow rate of deposition of crystals from a viscous solution, the crude rotenone under such conditions being often somewhat impure.

As explained previously, a control determination of the total amount of ether extract is also made, using for this purpose a separate portion, 5 grammes,

of the finely ground root. In this connection it may be mentioned that this figure can also be evaluated by adding to the percentage of rotenone that of the residual amount of ether extract. The latter can be determined by making up the filtrate from the rotenone precipitate to a definite volume, evaporating an aliquot portion to dryness and weighing the residue.

With regard to the general question of the method of estimation of rotenone a proposal has been put forward by the United States Department of Agriculture (11) to substitute carbon tetrachloride for ether on the grounds that the rotenone separates more easily as a complex from the carbon tetrachloride solution and in a greater state of purity than from the corresponding ether extract, more reliable results being obtained. Further, it is stated that samples of roots from which no rotenone could be separated, using ether, even when the extract was seeded, gave carbon tetrachloride extracts from which rotenone separated readily, as much as 2 per cent. being obtained in the case of one sample.

The method has been tried but without the same degree of success, results of greater accuracy having been obtained with ether than with carbon tetrachloride. Since, however, the question is still under correspondence a final decision as regards the adoption of a definite solvent for assaying roots must therefore be delayed.

Results of Analysis.

The figures in the following table, which give the results of analysis of samples of roots taken recently from consignments offered for sale, will afford some indication of the wide variations as regards both the amounts of crude rotenone and of total ether extract. In order to make the table as concise as possible the figures have all been calculated on a moisture-free basis.

Sample No.	Crude Rotenone per cent.	Ether Extract per cent.
1	5.9	24.0
2	7.7	22.8
3	1.0	22.3
4	4.7	22.6
5	Nil	2.3

Based on the proposed method of valuation by rotenone content the results clearly indicate the necessity for assaying individual consignments of roots on account of the wide variations. In this connection it may be mentioned that, taking the series as a whole, the figures, calculated on a moisture-free basis, have varied in the case of the rotenone from nil to 8.1 per cent., the total ether extract from 2.3 to 29.1 per cent. It must be distinctly understood that there is no relationship between the crude rotenone as determined by the method referred to above and the total amount of ether extract. This question will be referred to later.

Examination of Different Species of *Derris* for Rotenone Content.

Apart from the variations in rotenone content the results of analysis indicated the probability of a species of *Derris* in which a high ether extract was combined with a relatively high rotenone content.

Before detailing the further steps taken as regarding ascertaining the particular species it seems advisable to recall the results of the previous work carried out at the Experimental Plantation, Serdang. The object of this investigation was an endeavour to correlate the age of harvesting with the toxicity, as judged by the amount of ether extract (5) (6), two species of *Derris*, *D. elliptica*, tuba puteh, and *D. malaccensis*, erect Sarawak, being examined. The results, which are summarised below, showed that the amount of ether extract was much higher for the roots of *D. malaccensis*, erect Sarawak, than for *D. elliptica*, tuba puteh. In addition, the results indicated that the optimum age of harvesting, as judged by the amount of ether extract, was approximately 23 months from the time of striking the cuttings, also that the amount of ether extract was greater in the case of the fine roots than the coarse roots.

Species of <i>Derris</i>	Optimum Age of Harvesting	Ether Extract (moisture-free basis)	
		Coarse roots	Fine roots
	months.	per cent.	per cent.
<i>D. elliptica</i> , tuba puteh	23	4.5	9.6
<i>D. malaccensis</i> , erect Sarawak	23	32.2	34.2

At the time of the investigation referred to previously, there were no plants of sufficient development to warrant harvesting, opportunity was therefore taken to analyse roots of six different species of *Derris* being grown on a small scale at the Experimental Plantation, Kuala Lumpur for the purpose of maintaining stocks of planting material. The plants were approximately 3 years old so that, judged by the previous results at Serdang, the roots were past the optimum age of harvesting.

The results of analysis, calculated on a moisture-free basis, are shown in the table on the next page.

From the point of view of rotenone content the results of analysis indicate that *D. elliptica*, tuba puteh, is the only species likely to meet the requirements of the American market, the rotenone content of *D. polyantha* although appreciable, being apparently of a much lower order.

It is interesting to note that while the roots of *D. malaccensis*, erect Sarawak, have a high figure for ether extract, they are lacking in rotenone.

The results serve to show the wide differences existing as regards both rotenone content and ether extract in species which differ only in their habit of growth, that is whether creeping or erect, and point therefore to the necessity of taking the greatest care as regards the selection of planting material in order to ensure the maximum yield of product.

Variety of Derris	Nature of Roots	Crude Rotenone	Total Ether Extract	Proportion of Crude Rotenone to Total Ether Extract
		per cent.	per cent.	per cent.
<i>D. elliptica</i> , tuba puteh	Coarse	6.5	22.6	28.8
...	Fine	6.8	24.8	27.4
<i>D. elliptica</i> , creeping Sarawak	Coarse	No coarse roots.		
...	Fine	Trace	4.0	—
<i>D. malaccensis</i> , tuba merah	Coarse	0.7	14.5	4.8
...	Fine	0.1	19.8	0.5
<i>D. malaccensis</i> , erect Sarawak	Coarse	0.1	24.2	1.7
...	Fine	0.8	27.3	2.9
<i>D. polyantha</i>	Coarse	2.7	12.6	21.4
...	Fine	3.6	14.4	25.0
<i>Derris</i> (species not yet identified)	Coarse	Nil	2.3	—
...	Fine	Nil	3.0	—

The figures also confirm the previous statement as regards the absence of a general relationship between the amount of ether extract and rotenone, although they do point to a definite relationship in this connection as regards species containing appreciable amounts of that compound.

In this connection it may be mentioned that although in the case of both varieties of *D. malaccensis* small amounts of rotenone are recorded, the figures cannot be relied upon with any particular degree of accuracy, the crude rotenone in all cases being comparatively impure.

Comparing these results with those previously obtained at Serdang it will be noticed that while the figures for the ether extract of *D. malaccensis*, erect Sarawak, are of the same order, those for *D. elliptica*, tuba puteh, show considerable variation. Apart from the possibility of planting material having been mixed, which seems far too remote, it is difficult to account for the difference, which it is thought can only be due to either poor soil conditions, lack of some particular plant nutrient or unsuitable environment. These points are being investigated. Against these possibilities it must be borne in mind, however, that an average yield of air-dry root, approximately 1,100 lbs. per acre, was obtained at the optimum age of harvesting. For the present therefore, the results of the original experiments with this species can only be regarded as abnormal.

As regards *D. elliptica*, tuba puteh, from Kuala Lumpur it may be mentioned that both the high figure for the rotenone content and the proportion of rote-

none to total ether extract have been confirmed as a result of analyses of roots of this species taken from estates where the crop is being systematically cultivated.

Enquiries from the estates in question showed that the original source of their planting material was Geylang, Singapore, where the root is cultivated on a small scale, principally for use in market gardens. Samples of root were accordingly obtained from that source, the results of analysis again showing both a satisfactory proportion of rotenone and the normal correlation between the amount of rotenone and that of the ether extract.

In view, however, of the abnormal results obtained to date at Serdang with this species it will be realised that no guarantee can be given that, even though high grade planting material is obtained, for example from Singapore, the plants when grown elsewhere in Malaya will yield roots of a similar high rotenone content.

In this connection it may be mentioned that in order to endeavour to elucidate this point, exchanges of planting material have been effected between Kuala Lumpur and Serdang, so that in due course it is anticipated the question of the present abnormal results obtaining at Serdang will be solved. Experiments are also being laid down with the object of ascertaining the variations in the amount of rotenone content with age of root.

General Considerations on the Preparation of an Extract.

As stated previously, the dried roots are exported, the roots being baled in order to save shipping charges. With the same object in view it is understood that the dried roots are sometimes finely chopped, the product being then packed in Venesta or other light wooden chests.

Apart, however, from the form of packing adopted it will be realised that even in the case of dried roots, freight charges are being paid on a relatively large amount of non-toxic material, for example, assuming all the matter extracted by ether has a toxic value it will be seen that in the case of *Derris elliptica*, tuba puteh, approximately 75 per cent. of the material has no toxic value at all.

Suggestion have been made therefore, to subject the dried roots to a process of solvent extraction in the country of origin, thereby obtaining a concentrated extract or even a crude rotenone for export. It is thought that there are considerable possibilities in this respect, provided the extract or product does not deteriorate on storage.

As regards the question of deterioration of tuba root on storage, experiments have shown that, provided the roots are dried, there is no appreciable change as regards either the crude rotenone content or the total ether extract after three months storage. For example, in the case of fine roots of *Derris malaccensis*, erect Sarawak, the figures, calculated on a moisture-free basis, for the total amount of ether extract from fresh roots and roots stored for 3 months were 24.8 per cent. and 25.2 per cent. respectively.

Assuming, therefore, the acceptance of an extract by the trade for use in proprietary insecticidal preparations two points arise, the distribution of the toxic principles, including rotenone, in the roots in order to select, as far as possible, for extraction only those portions richest in this respect, and secondly, a suitable solvent.

As regards the distribution of the toxic principles in the roots, experiments are being carried out in which roots from freshly dug plants of different species have been separated into various sizes, each portion being then peeled in order to separate the cortex from the endoderm, the proportions of the constituents recorded, and analyses made of both constituents for rotenone and total ether extract.

While it is realised that peeling, especially of the fine roots, is not a practicable proposition on a large scale, the experiments should show definitely the size of roots which it would be an economical proposition to treat, also whether in the case of the coarse roots for example, which are not at present acceptable to the trade but which are comparatively easy to peel, it would be an economical proposition to separate either cortex or endoderm for further treatment.

While no recommendations can be made at present as regards the choice of a suitable solvent, it may be mentioned that ether, although satisfactory for laboratory purposes, would be unsuitable for large scale operations. This is due partly to the heavy losses of solvent which the use of a liquid with such a relatively low boiling-point, 35°C., would entail and also to the fire-risk, ether being a highly inflammable liquid.

The question of the choice of a solvent is also related to the degree of solubility of rotenone regarding which it is intended to carry out some experiments in the near future.

Remarks and Conclusions.

The results of analysis of samples of tuba root drawn from commercial consignments show wide variations in rotenone content.

As a result of the analyses of samples of roots from individual species it appears that the variations are due to commercial consignments frequently consisting of roots from different species of *Derris* and also of varying age.

As far as the results of analysis of individual species are concerned, the figures to-date indicate that *Derris elliptica*, tuba puteh, offers the best possibilities as a source of rotenone. The optimum conditions of cultivation and harvesting have yet to be determined.

The roots of the other variety of *Derris* commonly occurring in Malaya, *D. malaccensis*, erect Sarawak, would appear to be lacking in rotenone.

As stated previously, the results of analysis of the roots of different species for rotenone content are not to be considered as indicative of their relative toxicities. The latter can only be determined as a result of controlled tests on different classes of insects.*

* Arrangements are being made for the carrying out of extensive biological and chemical tests in this Department.

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THE COFFEE CLEAR WING HAWK MOTH

(*Cephonodes hylas* L.)

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When coffee was a flourishing industry, the caterpillars of *Cephonodes hylas* inflicted extensive damage to coffee bushes and were responsible for some reduction in the area of cultivated coffee throughout Malaya.

Ridley ⁽¹⁾ in 1891 drew attention to the fact that the caterpillar of this insect was very destructive to coffee by devouring the leaves and clearing bushes with astonishing rapidity and suggested that it usually attacked weakly plants and wrote in 1900 ⁽²⁾ an account of its life history and control measures "since the enormous damage caused to the coffee in the past two years by the bee-hawk moth (*Cephonodes hylas*) especially in Selangor in the neighbourhood of Petaling caused so much alarm". The next reference appears after an interval of seventeen years by Munro ⁽³⁾ who stated "Touching lightly upon pests, no one who saw and has been made aware of the damage done to estates by the caterpillar of the bee-hawk moth would enter upon the cultivation with the idea that, given good prices, all would be well. Assuredly this pest will make its appearance again but the knowledge of remedial measures is more available now than it was and for safety and insurance against the spread of this devastating pest I would strongly recommend that no large areas be planted without dividing belts".

Richards ⁽⁴⁾ refers to this pest in the same year thus, "Coffee growers should keep a watch for *Cephonodes hylas*, the caterpillars of which have been taken frequently on coffee and *Gardenia*".

In 1928 ⁽⁵⁾ it was stated that this pest had been observed every month, except November and December, and ⁽⁶⁾ in the Annual Report on the Entomological Division for 1928, that its caterpillars had caused extensive defoliation of coffee bushes in Johore and that an encyrtid egg parasite had been discovered and possibly was the responsible agent for the termination of outbreaks. In 1930 ⁽⁷⁾ another brief reference was made concerning *Gardenia* as an alternative host plant of this insect.

Distribution.

The distribution ⁽⁸⁾ of *Cephonodes hylas* Linné is given as the Aethiopian Region, India to Japan, Flores to Australia and the three subspecies thus, *C. hylas virescens* Africa, South of the Sahara and Madagascar, *C. hylas hylas* from Ceylon northward to China and *C. hylas cunninghami* Flores to Queensland. These authors further state that "The

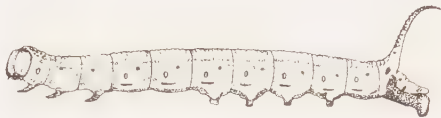
EXPLANATION OF PLATE.

CEPHONODES HYLAS L.

- 1 and 2. Full grown caterpillars, (about nat. size).
3. Branched spines of first instar larva.
4. Egg on young leaf (about nat. size).
5. *Cephonodes hylas* L.
6. Pupae, ventral and lateral views (about nat. size).
7. *Ooencyrtus malayensis* Ferr. (much enlarged).
- 8 and 9. *Sycanus leucomesus* Walk., dorsal and lateral views (about nat. size).



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individuals of *Cephonodes* recorded as *hylas* from the larger Sunda Islands belong to *picus*: no individual of *hylas* has so far been found, to our knowledge, in the Malayan District proper. This is certainly very remarkable, as the insect is common in North Australia, India, China, Japan and Africa."

Cephonodes hylas was reported for the first time in 1925 from Uganda as of minor importance to coffee. In Ceylon it has been for many years on *Gardenia*, in Sumatra it is also recorded as a pest of coffee and in Malaya, for more than forty years, the caterpillars have damaged both *Gardenia* and coffee.

Description of the Stages (V. Plate).

The Moth.

The wings transparent; veins, and anterior border black; bases of anterior and posterior margins of both wings covered with olive green scales. Antennae black, slightly clubbed. Dorsally, head, thoracic and first three abdominal segments olive green, fourth and fifth reddish brown, other abdominal segments yellowish with a reddish brown patch in middle of sixth abdominal segment. Ventrally, head, thorax, middle of first three abdominal segments and sides of sixth and seventh segments white, sometimes slightly yellow; fourth and fifth generally completely red-brown, but frequently centres black; other abdominal segments mid-ventrally black or red brown. Legs white with tarsi dark brown to black. Tail black. Wing expanse about 52 mm.

The Egg.

The egg is subspherical about 1 mm. in length and 0.9 mm. in breadth, smooth, shining and greenish yellow in colour.

The Larva.

First Instar.

Length about 3 mm. and breadth 0.5 mm. Head and body at first yellow changing later to dull greenish yellow. Head with simple setae; anal horn black, densely covered with short bifurcate setae and divided with the apex of each fork rounded and bearing a short seta.

The body has two conspicuous subdorsal longitudinal rows of blackish spines, the majority with four branches, some, however, with two and others six.

The first instar larva full-grown is about 7 mm. in length and 0.7 mm. in breadth.

Second Instar. (one day after moulting).

Head, thoracic and anal segments lemon yellow, thoracic and abdominal legs and other segments of the body grass green. Body densely covered with minute black bifurcate spines. Anal horn about 2 mm. in length, black, divided apically and armed with small bifurcate spines. Spiracles greenish in colour. Length 8 mm., breadth 1 mm.

Third Instar.

A marked change in colour has occurred. The colour is dark green with a dorso-lateral white line on each side. The pro-thoracic shield and anal plate yellowish with distinct granules. Above the line of spiracles, which are white with yellow centres, nine black spots, one to each of the second, and the third thoracic and to the first seven abdominal segments. Thoracic legs black at base, rest reddish; abdominal feet dark green. Anal horn black and armed with small bifurcate spines; the body clothed with minute dark bifurcate spines. Length about 15 mm., breadth 2.5 mm.

Fourth Instar. (one day after moulting).

Head and body grass green, thoracic legs at base black, rest reddish brown, and abdominal legs dark purple; a dorso-lateral white line on each side running from head to anal horn is prominent. Immediately below this line a large black spot to each of the meso- and meta-thoracic and the following eight abdominal segments is conspicuous. Spiracles, situated below but slightly anterior to the black spots on the abdominal segments,

are white with orange centres. Pro-thoracic shield especially and anal plate with small granules, some yellowish in colour. Anal horn black and armed with spinous processes. The body comparatively smooth with very minute setae. Length 22 mm., breadth 3.5 mm.

Fifth Instar. (one day after moulting).

Head: grass green, dorsum blue grey, sides, first thoracic segment and anal shield apple green: a dorso-lateral red stripe runs length of the body. Adjacent to this stripe ten black spots from the second thoracic segment to the anal horn. Spiracles white with orange centres and encircled with a reddish brown border. Abdominal spiracles situated below and slightly anterior to the black spots. Below the abdominal spiracles black linear markings present. Above abdominal legs colour deep violet grey. Basal joint of thoracic legs black, others reddish brown. Abdominal feet pinkish cinnamon. Pro-thoracic shield and anal plate with granules, some on the former are yellow, others yellowish green.

Anal horn yellowish green with tip black and with short black spines. Body covered with very minute setae. Full-grown about 70 mm. in length, breadth 9 mm.

Note. The colouration of the various instars has been described from the same caterpillar but the colour is markedly varied in different larvae. Caterpillars may be almost completely black, others may have the dorsum dark brown with lateral splashes of black and red, others again may be green with lateral splashes of black. The colouration of the instars described may, however, be considered as the most general.

The Pupa.

The caterpillar before transforming into pupa is olive green in colour. The newly formed pupa has head and thorax dorsally emerald green, thorax ventrally a deeper green. Abdomen chestnut brown but ventrally intermingled with shades of yellowish green. Subsequently the pupa is shiny blackish brown. Length 32 mm., breadth 7 mm.

Economic Importance.

To estimate the monetary loss due to this insect would be difficult. So many factors have to be taken into consideration, such as the condition of the coffee before attack, the average yield and price of coffee obtaining, the number of bushes which after attack finally succumb to disease—a form of die back—and naturally the intensity of attack on the leaves and berries.

Ridley in 1891 recorded that "usually weakly plants were attacked" but during extensive outbreaks healthy bushes do not appear to escape the attention of this insect. In his paper in 1900 Ridley states "In the beginning of February, six weeks after the caterpillars had been noticed, they had spread over from one half to two thirds of the estate and in many places could be seen rows of from 30 to 40 trees stripped of leaves and with the berries gnawed". Mr. Aldworth in a report to Government, counted at this time of the year 204 caterpillars on an average tree, and estimated that there were 90,000 to an acre or about 22½ millions to the whole plantation. Further he states "The estate coolies being insufficient to keep down the pest, though destroying 300,000 caterpillars a day, the Selangor Government assisted by supplying additional labour and in a few months the plague was so reduced as to be manageable."

Butler ⁽⁷⁾, then of the Selangor Museum, writing of the occurrence of this insect stated "There were then (January 31st., 1899) millions of the caterpillars busy at their work of devastation, almost all were full-grown or of medium size. The amount of damage done was extraordinary, a large acreage being

almost completely stripped, as many as 50 or 60 consecutive trees often not having a single leaf left on them. On these trees the caterpillars were busily feeding on the rind of the green berries to which they invariably turn when the leaf supply is exhausted. Whole branches of berries had suffered thus, looking very much as if the rind had been gnawed off by mice".

Mr. F. de la Mare Norris, Principal Agricultural Officer, Johore, reported on the 22nd. December, 1928, that "there is a serious outbreak of *Cephonodes hylas* on coffee at Paloh. The area attacked is estimated at about 1,500 acres out of a total of about 2,000 acres. I gather that the pest has been present for some months. At the time of my visit on 20th. December most of the larvae were in the young stages and the moths were still busy depositing eggs on the coffee bushes. The last generation of larvae was apparently the most serious and a large number of the coffee bushes have been absolutely stripped of leaves — in many cases even the unripe berries have been attacked". The senior writer visited this area on the 3rd. and 4th. January, 1929, when the caterpillars were mostly full-grown and pupae were found without difficulty. The bushes had been almost completely defoliated over an extensive area and new buds as soon as they appeared had been eaten. Not only the leaves but the berries — ripe and green — had been gnawed and even the bark on some bushes had not escaped the attention of the caterpillars. The cultivators had succumbed to the practice of distributing red flags through the area in the hope that through them the pest would disappear. This area was re-visited on the 17th. January, for the purpose of making further observations on the behaviour of the moth and also to ascertain if its eggs were parasitised. Subsequently Mr. Norris sent information that he again visited the area on 25th. March and found a considerable improvement largely as a result of twenty-one notices having been served on the owners to collect the caterpillars. Most of the trees that were badly attacked by caterpillars had subsequently been attacked by a die back and some were shooting out again from ground level, but by April 17th. very few caterpillars were found on the coffee plants.

At Bukit Kapar, Selangor, in addition to a considerable reduction in the yield of coffee following an outbreak of this pest during the last few months of 1929 and the first few of 1930, Mr. A. E. C. Doscas * estimated that five per cent. of the attacked bushes had died as a direct result of caterpillar attack. This area of coffee was under observation until about May, 1931, and although caterpillars had been fairly numerous they had been successfully controlled by frequent hand collection. In November, 1931, the coffee in this area had fully recovered from the 1929 — 1930 attack and the crop production was becoming normal, i.e. after a period of 18 months.

The above survey indicates that a conservative estimate of the reduction of the yield of coffee by this insect over heavily infested areas would probably be in the neighbourhood of sixty per cent.

* Then Agricultural Field Officer, Selangor.

Seasonal History.

The available records have established that this insect has been especially prominent in November, December, January, February, March and April. It has been collected, however, on *Gardenia* or coffee in every month of the year but no reports of extensive damage have been received for the months of May, June, July, August, September or October.

The 1898 outbreak in Selangor was evident in the latter half of December and the 1928 outbreak in Johore in November, the former outbreak appears to have terminated in May and the latter in April. History provides no evidence that this insect was present before December in the Selangor outbreak, but, prior to the Paloh, Johore, outbreak two caterpillars, which were found in July, 1928, on the leaves of Liberian coffee grown on a small holding near Paloh, were received for identification. This is evidence that this insect was present in the Johore area in July, 1928, but not in sufficient numbers to attract particular attention. In December, 1928, the following information was received from Paloh "In the middle of November the pest appeared on coffee trees and I tried to destroy it by removing the larvae. However, it was not effective and on or about 5th. December there again appeared many eggs which hatched within a few days. The pest is multiplying wonderfully and an estate of 200 acres planted with coffee only and adjoining to my own estate is under a condition of total destruction".

The presence of insects is most generally reported when they occur in large numbers but a gradual increase in populace is the rule; moreover the damage to, or decrease in, yield of the plant and not the insect appears to attract first attention, and although excessive defoliation may be noticed in say November, caterpillars in increasing numbers might have been observed several months earlier if plants had been carefully examined. It has already been mentioned that this insect has been collected throughout every month of the year and since an increase would appear to commence about July, it is of particular importance that from that month careful examination of bushes for caterpillars should take place. If this is not performed, defoliated bushes will attract attention probably in about November, when with difficulty and cost this pest may be reduced only after having caused entire defoliation and even the death of bushes.

The factors influencing the increase and decrease of insects are very imperfectly understood. In some cases the presence or absence of disease, often bacterial, is responsible. In Malaya, more especially on the western side, most rain occurs in the months of April and November. The dry months of the year are June, July and August, that is, during the months the increase of this insect occurs. The rainfall may be stated generally to be spread over from October to April—the month this moth would appear to be finally reduced. Butler remarks that "Very heavy showers of rain at the time when the young caterpillars are hatching and in large quantities are apparently very destructive, washing the tiny larvae off on to the ground in great numbers when, unable to

regain the foliage, they perish in the dust, or are destroyed by ants. Probably warm sunny weather with occasional light showers is the most favourable to a batch of these pests. The heavy showers at the end of February did much to reduce their numbers and the recent drought has also proved very unfavourable to the insects, the pupae dying underground for want of sufficient moisture". Whilst very heavy showers may be responsible for assisting in the destruction of numerous young larvae, the Johore and other outbreaks have extended through the wettest months of the year. Six to seven generations of this insect are possible from October to May. It would, therefore, appear that in the case of this insect, wet weather has no particular influence on its mortality. It has also been suggested that this insect commences to increase during dry weather and this condition would not therefore appear to have any direct influence on the disappearance of this moth. The disappearance of this moth is undoubtedly greatly influenced by the amount of food available. During the visits to Johore a considerable number of almost full-grown caterpillars must have died of starvation, since they were observed eating the remaining portions of leaves, green and ripe berries and even the bark. The moths too were very active, laying their eggs on the remnants of leaves on the bushes. Ridley observed that "when the coffee leaves had been so far destroyed that there was not a sufficient supply for the moths they were seen to deposit their eggs on lalang grass or other herbage". The caterpillars hatching from these eggs would undoubtedly have succumbed as the only alternative food which is not generally available in coffee areas is *Gardenia*. It may, therefore, be considered that starvation is the principal factor in reducing the caterpillars but in addition, the encyrtid egg parasite, *Ooencyrtus malayensis* Ferr., which was obtained from the eggs of *Cephonodes* during the Johore outbreak, on the reduction of caterpillars by starvation, would be enabled to cope with the eggs laid by the succeeding generation of moths. Of two hundred and forty two eggs which were collected in the field at Paloh on January 26th., 1929, *Ooencyrtus* emerged from one hundred and two. It will be realised therefore that this parasite must undoubtedly play an important rôle in the ultimate natural control of this insect.

Habits.

The moth is very active on the wing, flying with great rapidity from one coffee bush to another and is not by any means easily caught. It is diurnal in habit, is seen more especially when the sun is shining and is attracted to coffee flowers for the purpose of sucking the nectar. The distance that the moth is capable of flying is not known but it is undoubtedly very considerable.

The eggs are laid singly, most generally on the undersurface of the youngest leaves. In the act of depositing an egg the moth does not settle but, hovering near the leaf, bends her abdomen forward and almost drops an egg on the leaf where it sticks. Eggs may be laid on the day of emergence but in captivity they have been laid on the fifth day after emergence of the moth. Pairing has

been observed on the day of emergence but generally this does not occur so soon. The copulatory act has lasted for more than four hours. In captivity the largest number of eggs laid by an individual was seventeen, but from dissection, a female would appear to be capable of laying as many as ninety, under normal conditions. The male moth lived in captivity six and the female ten days.

The caterpillar on emergence completely digests the egg shell and feeds subsequently on the surface of the leaf for sometime before devouring the entire tissue. It undoubtedly prefers the younger leaves and has been observed to leave mature for more succulent leaves. In very severe infestations the caterpillars are driven to feeding on the green, then on the ripe berries and finally on the bark of bushes. All varieties of coffee are subject to attack but liberian would appear to be the most favoured. The increase in size of the caterpillar mostly occurs during its last larval instar, about a week before it is full-grown. During this period, its growth is most marked and most damage to the bushes occurs since it consumes an enormous quantity of leaf material.

When alarmed the caterpillars cease feeding and, raising the forepart of their bodies, arch their "necks" and remain motionless. When molested the younger caterpillars secrete a yellowish green fluid and the older caterpillars a more greenish brown fluid which on exposure becomes somewhat golden brown. The caterpillars show a marked colour variation during their life and the uninitiated would probably consider that more than one pest was present. The colouration of the instars of one caterpillar has been described but differences in colour in other caterpillars are frequently very marked. The general colour of most, however, is green with a white or red longitudinal line and black conspicuous spots on each side of the body and all are characterised by a prominent anal horn.

When the caterpillars are full-grown they descend the bushes to the ground and pupate generally about 2 ins. below the surface of the soil. Pupation may, however, take place in any position considered favourable, such as under accumulations of leaves, near the bases of bushes, under fallen timber and indeed in any place which affords some slight protection. The caterpillars at first hollow out a suitable cavity and transform to pupae.

Life Cycle.

The egg hatches in from 3 to 4 days and during the process of growth the caterpillar passes generally through five instars, the first moult in the caterpillar under observation occurring two days after it had emerged from the egg, the second three days after the first moult, the third two days after the second moult, the fourth three days after the third moult and the fifth at pupation, about six days after the fourth moult.

In the process of moulting in the caterpillar under observation, the head capsule was discarded after the larval skin had split at the neck. No cleavage of the median suture was observed. The casting of the head capsule occupied about three and three quarter hours. As soon as the head capsule had been cast, the skin was gradually worked backwards—no cleavage of the skin occurred—the legs being uplifted and the anal horn drawn out. The moulting of the skin was finished in about a half hour when the caterpillar turned round, devoured the cast skin and almost immediately afterwards fed on leaves. During the process of moulting the caterpillar walked about one inch and this appeared to be connected in an attempt to dis-associate its prolegs from the cast skin.

It is interesting to record that a caterpillar which had lost its anal horn emerged as a perfect moth.

The active larval stage of the above caterpillar, on which the colour variation and the length of time of the instars were observed was fourteen days. In other caterpillars which were not disturbed, the length of the active larval stage varied between 12 and 29 days — the majority 21 days. The pupal stage which includes the inactive larval period before pupation, has been found to vary between 12 and 19 days but for the majority the period is 13 days. The Life Cycle may be Summarised thus:—

Egg Stage	...	3 — 4 generally	3 days.
Larval Stage	...	12 — 29 „	21 „
Pupal Stage	...	12 — 19 „	13 „
		27 — 52	37

It will be seen therefore that this moth generally completes its life cycle in 37 days and at intervals of about five weeks moths will be present in their maximum numbers.

The Enemies.

Ooencyrtus malayensis Ferr. (8)

The most important enemy of *Cephonodes hylas* is the minute chalcidoid egg-parasite *Ooencyrtus malayensis* Ferr. which was first obtained from eggs of this insect on the 24th. January, 1929, at Paloh, Johore. It would appear to be fairly well represented in Malaya and probably other hosts await discovery. It was first collected in January, 1921, by W. A. Lambourne from Kuala Lumpur, and was subsequently submitted to the Imperial Institute of Entomology by the senior writer from eggs of *Leptocorisca acuta* L., from *Papilio polytes* L. and from *Papilio agamemnon* L.

Description *

Ooencyrtus malayensis Ferr. is a very small insect from about 0.5—0.8 mm. in length. Body black with metallic green reflections on the head and the thorax, more purple on the sides; abdomen brown, with a broad transverse yellow stripe on the base. In the male the thorax is more bronze and the abdomen is not yellow at base. Antennae mostly yellow, and legs entirely yellow.

Habits.

Detailed information concerning this parasite is not available. The time taken from the laying of an egg by the parasite in the egg of *Cephonodes* and the emergence of the adult parasite from the egg is probably 13 days, since, in the collection of 24th. January, the last parasites emerged on the 6th. February.

A *Cephonodes* egg provides sufficient food for the development of at least three parasites. In a collection of twenty one parasitised eggs which were individually kept in different vials, from one egg three parasites emerged, from fifteen eggs two parasites emerged from each and from five eggs one emerged from each. It will be seen that the majority of these eggs supplied sufficient food material for the development of two parasites.

Sycanus leucomesus Walk.

This Reduviid bug is sometimes numerous and has been observed to feed upon both caterpillars and moths of *Cephonodes* using its long curved beak for this purpose. It has, however, little controlling influence.

* Mostly taken from the description by Ch. Ferrière.

Sycanus leucomesus Walk. is a black shining insect about 25 mm. in length with a markedly curved beak and with a strongly dilated abdomen. The forewings have a yellowish area about the middle with the membranes bronzy.

The nymphs are easily recognised being orange red with black markings.

Forcipomyia hirtipes de Meij.

In connection with the above mentioned parasitic and predaceous enemies it may be of interest to record that this small midge was collected in the act of sucking a caterpillar of *Cephonodes* and, after removing the caterpillar from the leaf and placing it in a tube, it was still feeding when the caterpillar was examined after about half an hour. The caterpillar was bred through to moth thereby indicating that no permanent injury had been inflicted.

Birds.

Ridley records that the magpie robin and common bulbul devour the caterpillars. They would appear, however, to have little controlling influence.

The Control.

The alternative host plants growing in coffee areas of this hawk moth should be eradicated. *Gardenia* being the only recorded species of plant other than coffee on which the caterpillars feed should not be grown in the neighbourhood of coffee areas.

The records of the seasonal history of this insect have shown that reports of extensive injury to the coffee leaves have not been received before the month of November and have indicated that the increase probably commences during the drier months of June, July and August. It is particularly important, therefore, to prevent the possible increase of this moth, that the coffee bushes during the above mentioned months should be continually examined and all caterpillars destroyed. If an area has been found with numerous caterpillars, especial attention should be directed to that area and the collection and destruction of all the caterpillars should be energetically pursued. The colouration of some of the larval stages resembles so closely that of the coffee foliage that the caterpillars are liable to be overlooked, and although the bushes may be considered to be free it is advisable that they should be shaken vigorously when other caterpillars, if present, will fall to the ground.

The moth is very conspicuous, especially when the sun is shining and flies speedily from one bush to another. In most cases whenever a moth flutters around a leaf she deposits an egg. A constant watch should be kept for the moth, since it is an indication that caterpillars are present. The eggs are small, but with a little experience can be comparatively easily detected since they are exposed most generally on the younger leaves. They should, as far as possible, be collected and destroyed.

The pupae are practically always concealed and may be found just below the surface of the soil, under the protection of fallen timber and accumulations of leaves. Such places should be examined as one destroyed female pupa means that the damage resulting from the attack of about eighty caterpillars is prevented.

Constant inspection of the bushes, resulting in the collection and destruction of the caterpillars, should prevent this insect ever reaching pest proportions, but if this precaution has not been taken and the caterpillars have thereby increased, the above recommendations should be carried out and in addition the leaves poisoned with lead arsenate. An outbreak of this pest, which had been in progress for some months in the Sepang area, succumbed in a very short time to the action of this insecticide, whereas the collection of all stages had previously failed to reduce it to insignificant numbers. Lead arsenate at the rate of 2 lbs. to 50 gallons of water was the recommendation. The advantage of using lead arsenate is that if it dries on the leaf it is washed off with difficulty and will remain effective for some months after the bushes have been sprayed. Whilst recommending lead arsenate, it is realised that it is not within the reach of every cultivator and if it cannot be obtained, the extract from 2 lbs. of tuba root diluted to 10 gallons with water, though not so satisfactory as lead arsenate, will be found to be effective. In spraying coffee bushes or other plants regard must be paid to weather conditions. It is useless to spray when it is raining and inadvisable to do so when the weather is threatening. The best time to spray is in the early morning and when a bright day is anticipated.

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A PRELIMINARY NOTE ON THE REACTION OF PADI SOILS

BY

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In the course of recent investigations on padi soils in the field it was noticed that there were large differences in the pH value of the soils when in the flooded condition compared with those obtaining during fallow, typical changes being from pH 4.5 - 5.0 to 6.5 - 7.0. Further investigation showed that there was a reversal as soon as the irrigation water was run off, the backward change at this stage before fields have dried out, being from about 7.0 to 5.8. In the laboratory changes from 5.2 to 7.1 have been observed in a period of five days.

Changes in a similar direction, but of far smaller extent, have been noted by Subrahmanyam* who observed that both Indian and Rothamstead soils became distinctly alkaline on waterlogging, changes from pH 7.5 to 8.2 being observed. The changes in these latter soils were shewn to be connected with the increase in the ammonia content. Although this may hold in part in Malaya there is evidence that the equilibrium between iron in the ferrous and ferric state plays no small part in determining the reaction of these soils and the possibility of ferrous iron acting as a base must be considered.

Investigations both in the laboratory and in the field are in progress on the mechanism of the changes described, as variations of these magnitudes may be expected to influence profoundly absorption by the rice plant.

* Subrahmanyam, V. *Journal of Agricultural Science*, 1927, Vol. XVII, page 435 - 436.

Review.

Eleventh Report on Native Rubber Cultivation. Second Quarter 1932.

Prepared by the Bureau of Agricultural Economics of the Division of Agriculture of the Netherlands Indian Department of Agriculture, Industry and Commerce, at Buitenzorg, Java, August 22nd, 1932.

The production of rubber during the period under review, as in previous quarters, bears a close relationship to price movements. During this quarter exports were 5,270 metric tons less than during the first quarter and nearly 13,000 tons less than in the corresponding period of 1931. The exports from Acheen, Tapanoeli, Sumatra West Coast, Banka and Billiton have shrunk to minimum quantities, while exports from other regions have also decreased considerably.

The report examines the reaction of various groups of producers to the decision against the introduction of restriction. It is found that the production and export of estate rubber in British Malaya and Netherlands India shew little reaction to the decision, exports of estate rubber from Netherlands India remaining at almost the same level as in 1931, while estate production in Malaya is slightly above 1931 production.

On the other hand, native rubber in the main exporting countries shew a decline in production, such decline being more strongly marked in Netherlands India than in Malaya.

A comparison is also made of the area of tappable rubber untapped. These figures shew that the trend for estates to go out of tapping at first reached greater proportions in Malaya than in Netherlands India. After the announcement concerning non-restriction, however, the latter country soon overtook Malaya. At the end of June 1931, 131,301 hectares in Malaya and 103,561 hectares in Netherlands India of tappable rubber on estates was untapped, representing 23 per cent. and 27.1 per cent. respectively of the tappable rubber on estates.

Thus, although about one-quarter of the tappable rubber on estates in these two countries remains untapped, yet production is about equal to that of the previous year. The publication adds:

“It is not impossible, however, that as far as Netherlands India is concerned, the young plantations which are gradually coming into tappable age and which have never been tapped before and which will also not be tapped now, have been added in the table to the area not being tapped.”

Whatever be the system of computation in Netherlands India, the Malayan figure of area tappable at the end of 1931 includes as far as possible, all areas of rubber which have reached a tappable size although owing to economic conditions they may remain untapped at the present time.

D. H. G.

Miscellaneous Articles.

CONDITIONS ON SMALL RUBBER HOLDINGS IN MALAYA.

Second Quarter, 1932.

Rainfall.

The normal spell of dry weather in the first quarter of the year terminated towards the middle or end of April and was followed by weather which was generally showery although the actual rainfall was variable, dry weather being experienced along the west coast and in the plains of Kelantan.

In June, the rainfall in the central areas of the Peninsula was distinctly below normal, with the exception of Pahang, where the fall was up to the average. In Kedah the weather was variable, being wet in the Northern districts during the first week of June. Penang and Province Wellesley experienced showers, and there was a good rainfall in Singapore.

Prices.

A table is given to show the range of prices received by small-holders for their rubber sold to local dealers, together with the average monthly Singapore price for standard sheet for the purpose of comparison with them. The prices quoted at the end of each month by large dealers for small-holders' rubber are also given. All quotations are given in Straits dollars and cents for the price per picul, i.e. 133½ lbs.

It should be borne in mind when comparing these figures that the quotations give the range of prices over a number of buying centres. The following shows the range of prices in dollars per picul for smoked sheet in five of such centres in Negri Sembilan during the month of June.

Seremban \$5 to \$6.

Port Dickson \$3 to \$5.25

Kuala Pilah \$4.75 to \$5.70.

Jelevu \$5.50 to \$6.25

Rembau \$6 to \$7.

Tapping.

The general position as regards tapping on small holdings has not shown any very noteworthy alteration since that obtaining during the first quarter of this year. The prevalent increase of interest in rice cultivation is still responsible for much of the large area of rubber out of tapping, the price of the commodity not making it worth the while of owners of padi land, whose time is fully occupied in their rice fields, to employ outside labour for tapping their trees on the profit sharing system, as heretofore. The same applies, to a somewhat lesser extent, to owners who possess land under food crops other than rice, or who have taken up land under temporary occupation licences in order to cultivate such crops.

In a number of districts tapping is done by torchlight before dawn or alternatively, left to children and the less able-bodied members of families: fishing, fire-wood cutting and fruit hawking are some of the many alternative occupations engaged in by the Malay small-holder.

In Malacca tapping on most Malay owned holdings continues more or less normally except for the customary decrease during the padi planting season. The Agricultural Field Officer, Negri Sembilan, reports that during the quarter under review, the area out of tapping has increased by 3,000 acres to a total of some 20,000 acres, i.e. 28.7 per cent. of the total area of mature rubber on small-holdings of less than 100 acres in extent. This figure of 20,000 acres was obtained—it should be added—from information supplied by Penghulus and does not take into account holdings of over 15 acres in extent, so that, since by far the majority of the larger Chinese and Indian owned holdings are out of tapping, the actual total must be greater than that stated above. This increase in the area out of tapping is probably attributable to the seasonal absorption of labour by padi planting, and by durian harvesting and the cultivation of other food crops. The report from Province Wellesley states that according to local dealers, only about 30 per cent. of the normal small-holders' rubber is now being handled by them.

The work connected with bark-consumption investigation progresses favourably, there are, however, 12 out of the ninety holdings under observation i.e. 13 per cent. on which tapping has ceased, but it is probable that a few of these will resume tapping operations in the near future. There is no indication, from the monthly measurements of bark consumption, of any increase in the average rate of excision on small holdings, although in a few districts, notably Muar and Batu Pahat in Johore, it is reported that tapping has become somewhat heavier than is normal, in order to obtain larger yields to counterbalance the low price received. It is not proposed to publish any figures in connection with the bark consumption investigations until the final twelve months measurements have been received and collated, as any data concerning only a few of the holdings is likely to be misleading and to differ considerably from the average over all.

Postponement or Acceleration of bringing Young Rubber into Tapping:

The position with regard to this subject remains unchanged; the amount of young rubber brought into tapping during the quarter has been negligible.

Disease.

Root Disease.—There is no noteworthy alteration from normal conditions to report under this heading. The officer in charge of the bark consumption work states that he has made further investigations in this connection on 25 of the selected holdings. A further tree-to-tree inspection has been made by him and lateral roots have been opened up and examined at from 4 to 5 feet distant from collar around every tree suspected of being diseased. On a total of 416

trees thus opened up he found 5 cases of *Ustilina zonata*, 24 *Ganoderma pseudosericeum*, and 2 cases of *Fomes lignosus*: i.e. a total incidence of 7.45 per cent, all of which were hitherto undiscovered from an above-ground inspection.

Mouldy Rot.—The increase in rainfall since the last quarter has brought a slight correlative extension of the incidence of this disease in many districts, notably Perak Central and South, Selangor, Penang, Kedah and Johore.

Oidium Heveae.—This disease was reported in April to have occurred in Perak South, Negri Sembilan, Malacca and part of Johore, none of the attacks however were of serious consequence. This disease has now been made notifiable by the Johore Government.

Grades of Rubber Made.

The statement made in the report for the first quarter of 1932 that "Unsmoked sheet still appears to be the most popular form of rubber sold by small-holders, more especially by the Malays", still holds good. In Malacca, figures received show that out of the total rubber sold 75 per cent. was unsmoked sheet, 11 per cent. smoked sheet and 14 per cent. scrap rubber. In Perak Central the proportions were as follows:—Unsmoked sheet 45 per cent., smoked sheet 35 per cent. and scrap 20 per cent.

The preparation of slab rubber has increased slightly in popularity in the Krian and Taiping districts of Perak where the price for this product has ranged from \$2 to \$3 per picul during the quarter. In Selangor, however, where previously a number of small-holders prepared slab rubber, the practice is now on the decline owing to the fact that many Chinese dealers refuse to purchase this form of rubber on account of its being frequently adulterated. In the Panchor District of Johore some small-holders sell their rubber in the form of latex, receiving payment on the weight of dry rubber produced from it by the dealers.

Tendency to Abandon Rubber Cultivation for Alternatives.

Reports from Selangor state that the number of owners cutting out rubber in order to make room for food crops has increased considerably during the quarter, the principal areas in which this has occurred being—Beranang, Kuala Lumpur, Klang, Bukit Kapar and the coastal areas of Kuala Langat.

It has not been found possible to estimate the total area on which rubber has been cut down, as in almost every case, only small patches where the growth has been poor, have been cleared for the planting of food crops. Small scale destruction of trees has also been observed in Perak, Negri Sembilan, Singapore, Penang and parts of Johore. A few cases of pollarding have been noticed, where food crops are planted between the rows.

Table of Rubber Prices.

2nd Quarter 1932.

	Singapore Standard sheet Average	Singapore for small holder's rubber at end of month	Penang for small holder's rubber	Kedah	Province Wellesley	Perak	Selangor	Negri Sembilan	Malacca	Pahang	Johore
Smoked sheet.	7.20	5.75	—	5.20-5.50	5-6.25	5-6.30	4-6	4-7	5-7	5-7	5.50-6.75
Unsmoked sheet.		4.25	5	4.20-4.50	3.50-5.65	4-5	3-5	3.50-6	4-6	3.50-6	2-5.90
Scrap		1.50	2-3	2	1.80-3	1-2.50	1-2.50	1-3	2-4	1-3	1-3
Smoked sheet	7.19	6.25	—	5.30-5.50	5.50-6.70	5-6.75	4-7.50	4-7	5-7	5.50-7.25	4-7
Unsmoked sheet		4.50	5-6	4.50-4.70	4.20-6	4.00-5.30	2-5.75	3-5.50	3-6	4-5	3-6.25
Scrap		1.75	2-3	2.80-3	1.50-3.20	1.50-2.80	1.50-3.40	1-3	2-3	1-2	1-3.50
Smoked sheet.	6.60	5.60	—	5.20-5.50	4.80-6.25	4.90-5.50	4.50-7	3-7	5-7	5-6	3.50-6.50
Unsmoked sheet.		4.25	4.50-5	4-4.70	4-5.25	3.80-4.50	3-5	2.75-5.25	4-5	3-4.90	3-5.50
Scrap		2.10	2	2.50-3	1.50-2.50	1.50-2.50	50cts-2.50	1-3	1-3	1-2.50	1-3

ENTOMOLOGICAL NOTES.

Third Quarter 1932.

BY

N. C. E. MILLER.

Lac.

It is perhaps not commonly realised that lac, which is used in the manufacture of varnishes, polishes, sealing wax, insulating material for electrical purposes, gramophone records and numerous other articles, is a resinous substance secreted by the female of a small reddish brown wingless insect.

In India, a lac insect, which is closely related to one of the species present in Malaya, has been cultivated with profit for many hundreds of years. The industry is also carried on in Burma, Siam and to some extent in Indo-China.

The origin of the designation "lac" has been traced to the Sanskrit "laksha" meaning a hundred thousand, and one need only observe lac insects at swarming time to satisfy oneself of the appropriateness of associating the word "lac" with these insects.

Lac insects which belong to the Rhynchota or "bugs" can be propagated on several species of trees, for example, in India the following trees are used.—*Butea frondosa*, *Ficus religiosa*, *Zizyphus jujuba*, *Acacia arabica*, Rain tree, *Cajanus indicus* and others. The lac produced by the insects, however, varies in quality and quantity according to the tree utilised.

In addition to lac, a crimson dye is obtained in the washing process which the lac undergoes in the course of preparation for the market. Formerly, this dye was a profitable by-product, but is now of little or no commercial value owing to the widespread use of synthetic dyes.

The young lac insects, the sexes of which are almost indistinguishable, are elongate ovate in shape and red. Each adult female of one Malayan species is capable of producing over 300 individuals.

These, on emerging from the incrustation of lac on the host tree, move to a suitable place on the same tree, and in the course of a few hours, settle down and begin to secrete wax and lac, the wax forming a thin film over the insect prior to the formation of lac. Wax threads also issue from the holes in the covering of lac. These threads eventually, in the case of the females, become so luxuriant as almost to obscure the lac.

Parasites and predators of the lac insect are important factors in the cultivation of lac, at all events as regards the industry as carried on in India. There appears, however, to be no adequate remedy against them at present.

Investigations are being carried out by the Division of Entomology, Department of Agriculture, S.S. & F.M.S., with a view to ascertaining whether a lac insect which is found in Malaya could be profitably cultivated.

Up to now, the species under investigation has been found on *Ficus*, *Macaranga* and *Mallotus*, and an attempt has been made to propagate it on the Rain tree, but unsuccessfully.

Hopes are entertained that it will be possible to extend propagation in a jungle area at present under observation without interfering unduly with the natural surroundings in which the insects live.

Tea.

The tea plant, although it has a number of insect enemies in Malaya, up to the present, has been attacked severely by a few only, of which three or four can be considered as major pests.

These pests comprise a Termite,—*Microtermes pallidus* Hav., a "nettle caterpillar"—*Thosca lutea* Heyl., a leaf roller—*Gracilaria theivora* Wals., and a grub of a cockchafer beetle which has not yet been identified.

Microtermes pallidus Hav., has been recorded attacking lowland tea and also a manure crop—*Crotalaria anagyroides* and shade trees *Albizzia* sp., the last named only very slightly however.

When attacking a tea plant, the workers of this Termite construct a tunnel, composed of small grains of soil, on the outside of the main stem. The bark under this tunnel is gnawed away, and when the branches are reached, the insects cut through them at the point of junction with the main stem causing them to break off and wither.

The entry into the main stem is sometimes made at points where branches have been pruned and not adequately treated.

Attempts, attended by a certain amount of success, have been made by the writer of these notes to locate nests of this species in order to find the queen. On the one occasion when a nest containing a queen was found, digging had been carried out over two areas having a radius of about 10 feet around *Albizzia* trees.

At first, quantities of the so called "fungus gardens" were unearthed. These lay at depths varying from four inches to about three and a half feet below the surface, and also varied in size from two to eight inches in diameter.

The nest in which the queen was found, was situated immediately below an *Albizzia*.

Control of termites in general and of this species in particular is by no means an easy matter. Paris green applied to plants has been recommended from time to time, but it is not likely to be effective except when it is possible to inject it into tunnels or borings.

Cyanogas is effective to a certain extent, but when the subsidiary nests or "fungus gardens" are scattered over a wide area and are not close together as in the case of mound building species of Termites, extensive digging operations have to be carried out in order to trace the galleries connecting nests, so that the nozzle of the generator can be inserted. The labour expended would about equal that of digging out all the nests.

In view of the fact that it is surmised that *Microtermes pallidus* makes an entry into tea plants at places where the wood is not quite healthy, owing to die back gradually setting in from a pruning point which has not been adequately treated with some antiseptic dressing, experiments which comprise pruning back the attacked bush until all signs of unhealthy tissue are removed, then treating the pruned surface with a mixture of paraffin wax and sulphur or paraffin wax and paris green to protect it until a callus is formed, are in progress.

Although this method at present appears to be satisfactory, it would be premature to state whether it will be effective or not.

The "nettle caterpillar" and the leaf roller have been dealt with satisfactorily by hand collecting; on the other hand, the grub of the cockchafer presents a problem which will require intensive study before adequate and economic measures for control may be established.

This grub lives below the level of the soil at a depth of 4—8 inches, the depth varying apparently according to the looseness of the soil. By gnawing the roots of tea plants it has caused many to die.

As far as one can judge at present, this grub is more destructive in periods of dry weather than when rain falls frequently. This suggests that lack of moisture is the chief reason why it attacks living plants when it can subsist equally well on rotting vegetable matter.

The possibility that plants which are not too healthy, owing to various reasons, are sought by this grub, should not be neglected.

Departmental.

**THE INTER-DEPARTMENTAL AGRICULTURAL
CONFERENCE, 1932**

BY

A. THOMPSON (*Joint Secretary*).

Explanatory Preface.

The *Malayan Agricultural Journal* issued in July, 1932, contained an announcement of the proposal to hold the third Inter-Departmental Agricultural Conference at Kuala Lumpur during the period August 2nd.—August 6th. 1932. The objects of the Conference were briefly outlined as follows — “To examine existing agricultural industries, other than rubber, with a view to ascertaining the present position, the immediate outlook and possible improvements and the means of introducing such improvements, using as far as possible existing machinery and resources. It is also intended to endeavour to ascertain what, if any, new industries can be introduced and what industries at present existing on a restricted scale, can be extended with the idea of lessening the dependence of this country on imported staples.”

The opening ceremony of the Conference by H. E. Sir Cecil Clementi, G.C.M.G. took place on Saturday, July 30th. 1932. The Conference was then adjourned until Tuesday August 2nd. and continued for a period of five days.

It was attended by representatives of the Civil Service, the Departments of Agriculture, Co-operation, Irrigation, Surveys, Customs and the Veterinary Department, under the Chairmanship of the Director of Agriculture for the sessions on August 2nd., 3rd. and 6th., the Director of Co-operation for the sessions on August 4th. and the Hon'ble the Acting British Resident, Selangor, for the session on August 5th.

The sessions on the first two days and the fifth day dealt with agricultural problems connected with the following crops — rice, copra, tobacco, fruit, vegetables, coffee, arecanuts, spices (including pepper), tea, groundnuts, sugar. Poultry raising and Chinese agriculture and vegetables were also included.

On the third day, questions relating to finance and general economics of peasant agriculture, with special reference to marketing and grading of peasant produce, were discussed.

At the sessions on the fourth day, draft resolutions embodying the findings of the Conference as a result of the discussions on the preceding days, were submitted and with some amendments, were confirmed. The questions of Agricultural Shows and Home Garden competitions were also considered and part of the afternoon session was devoted to consideration of certain matters in relation to land laws.

A short account is given below of some of the main points which received attention during the discussion of the various subjects on the programme of the Conference.

Rice.

Memoranda on the following subjects had been circulated—

- (a) Irrigation and drainage problems in large and small rice areas.
- (b) Colonisation of rice areas.
- (c) Organisation of supply and distribution of pure strains of padi.
- (d) Possible changes in systems of padi cultivation.

These memoranda were discussed and reports were made of progress in connection with work already inaugurated on lines recommended by the Rice Cultivation Committee.

a. Irrigation problems

The question of provision of labour in connection with development of large and small new rice areas received attention, and it was agreed that whereas in large areas involving the construction of fairly large drainage schemes the bulk of the labour should be provided by Government, in developments on a small scale it was desirable that the people it was intended to benefit should, where possible, be required to assist in the preparation of the land.

b. Colonisation of rice areas.

In connection with colonisation of rice areas it was considered that any schemes designed to secure the extension of rice cultivation in new areas would be unlikely to achieve a full measure of success unless adequate measures were provided to ensure the settlement of prospective cultivators in such areas in a satisfactory manner. It was suggested in this connection that colonisation officers of Malay race should be selected, preferably from the civil and administrative services, for such work. It was thought desirable that such officers should receive a certain amount of agricultural training, and that they should be acquainted with matters relating to the co-operation movement, land laws, irrigation etc. and that they should only be appointed to work in areas where large schemes affecting 2,000 acres and upwards were contemplated.

The question of provision of financial assistance to cultivators in new areas was also discussed, and attention was directed to the somewhat similar provision made in connection with land settlement schemes in Western Australia and elsewhere.

c. Possible changes in systems of padi cultivation.

The Conference was informed of preliminary work by the Department of Agriculture in connection with the growing of food crops on padi areas in the off-season, and of the possibilities in this direction. The question of growing

short term strains to provide for an increased number of padi crops was also discussed and progress in connection with trials of possible strains was reported. Reference was also made to the practice of rotation with grazing which had been successfully adopted in Italy.

It was the opinion of the Conference that in the present economic situation, it was desirable, if possible, to increase the productive capacity of wet padi land, either by growing an increased number of crops of padi, or by growing vegetables or other crops in a system of rotation, or by other means and that the Department of Agriculture should continue to carry on research work in this connection with a view to recommending the adoption of certain ideas if results proved successful.

d. Distribution of padi seed.

The methods now adopted by the Department of Agriculture were considered to be satisfactory. The importance of continuing work already in progress with regard to what has been termed the "filling" capacity of strains of rice, as well as flavour and appearance, was recognised.

The Conference was also informed of the results obtained by the Department of Agriculture in an investigation of methods of sampling of rice areas with a view to determining regional yields.

Copra.

The attention of the Conference was drawn to a publication by Mr. F. C. Cooke and Mr. H. J. Simpson, of the Department of Agriculture, on "Copra Production by the Malay Small Holder", and to a memorandum put forward by Mr. A. T. Newbould, M.C.S. entitled "A Copra Kiln at Sabak" giving details of a small venture in Sabak Bernam, in which he had taken an interest, for improving the quality of copra produced by Malays and also for the sale of the product.

It was considered desirable that efforts on lines suggested in these memoranda should be extended to all parts of the Peninsula where native copra is produced, inasmuch as they appeared definitely to tend to the improvement of the financial position of the raiat, since copra of the quality which could be prepared by small-holders, using the methods and the type of simple kiln described in the memoranda, appeared likely to find appreciably better prices.

In order to disseminate information in this connection and to instruct the growers in the erection of improved kilns and the operation of making and grading copra, it was considered advisable to take steps to train selected Malay Agricultural Assistants in this work.

Tobacco.

A summary of information concerning the possibilities of tobacco growing in Malaya was prepared comprising—

- (a) A statement of Imports;
- (b) A memorandum by the Chief Field Officer on the present position;
- (c) A memorandum by the Director of Agriculture on the possible steps for developing the industry;
- (d) A memorandum dealing with revenue considerations, prepared by Mr. S. G. H. Leyh of the Customs Department, was also circulated.

The matter was discussed at length during the sessions on the second and fourth days.

It was pointed out that the imports of tobacco into Malaya cost the country a great deal of money every year, and that there seemed good reasons to suppose that Malaya could succeed in producing the majority of the types of tobacco consumed in this country. The question of an export trade was not at present contemplated.

It was considered necessary to continue experimental work already in progress with regard to suitable dates for planting in different localities, best methods of curing to be employed and the most profitable types of tobacco to cultivate. It was stressed that the question of marketing should receive careful consideration with a view to circumventing the operations of rings and combines detrimental to the growers' interest.

In view of the highly specialised nature of the crop it was urged that if it could be arranged, the services of an officer with specialised knowledge and training in tobacco growing and curing should be made available.

It was recognised that, in connection with the fiscal side of the question, Government revenue should be safeguarded, and it was recommended that an inter-departmental committee be appointed to discuss the question of duties and to endeavour to devise a formula which would give adequate protection to the Government interest involved and which at the same time would be of such a character as to hamper the industry as little as possible.

Fruit.

Attention was directed to a memorandum by Mr. D. G. P. Olds of the Department of Agriculture, which gave very detailed information on the present position of the fruit industry in one area of the country—Malacca. The survey method was applied in this area, since it was considered that Malacca could be taken as a more or less typical example of a settled area in the Peninsula. In the memorandum certain suggestions were made for the improvement of the fruit industry.

It was pointed out that import and export figures of fruit do not show the real position, since imports are augmented by considerable, but unknown, quantities of fruit which come in, chiefly from the Netherlands India, as deck cargo not entered in ships' manifests.

It was considered that the quantity of fruit at present imported which could be replaced by produce grown in Malaya is considerable and that steps

should be taken to extend the cultivation of fruit by supplying planting material at cheap rates from agricultural stations, instructing growers in methods of fruit growing and by improving marketing facilities. It was mentioned that from time to time, local gluts of fruit occur in certain parts of the country and that this may coincide with shortage in other places. Consequently local market intelligence services would be of value if they could be organised.

It was considered advisable to extend the use of the survey method to other units in respect of the fruit industry and to other products in the case of which it is applicable.

Poultry.

The subject was introduced by a paper entitled "Poultry in Malaya" by Mr. J. Fairweather of the Department of Agriculture.

The paper gave a comprehensive summary of the present position of poultry raising in Malaya, a review of the total value of the import trade in poultry and eggs, and an account of the various breeds of fowls, as suggestions for the improvement of poultry husbandry in Malaya.

It was considered that of all the factors which hampered the improvement of the poultry industry the disease factor was the most important, and resulted in a heavy annual mortality which frequently rendered poultry keeping an unprofitable venture.

The Department of Agriculture had been unable to give much assistance, since there was no officer on the staff who could give his whole attention to the question which required specialised knowledge and study, while the Veterinary Department, through shortage of staff, had not been able to do very much so far in the matter of poultry diseases.

With regard to the question of Pathological research and preparation of vaccines it was considered that on account of the expense involved in carrying out such work, provision for elaborate research could not be advocated at the present time.

From results already obtained in control of poultry diseases by adopting prophylactic measures it was considered possible to effect a great improvement in the situation if poultry keepers could be instructed in such methods.

It was suggested that an essential step was the provision of a trained adviser on the subject of poultry who would be available for the entire Peninsula and in a whole time capacity.

With regard to breeding of fowls it was considered that the establishment of cross breeds was desirable and that the small scale efforts of the Department of Agriculture in this connection at Kuala Kangsar should be extended to other agricultural stations, combined with the establishment of a central breeding station at the Experimental Plantation, Serdang, so soon as funds and circumstances permitted. An interesting account of work done by the Co-operative Department in connection with marketing of eggs in Krian was given. It was

considered that the extension of this work to other units and its further systematisation was worthy of consideration, as and when the opportunity arose. It was thought that in furthering this work the services of a poultry expert would be of great value.

Coffee.

A memorandum which included a summary of imports and exports of coffee had been prepared from answers supplied to a questionnaire sent out to various Agricultural Field Officers.

In the discussion it was mentioned that there did not seem to be any reason why in due course, Malaya should not produce enough coffee to meet the whole of the local demand. Reference was made to existing enterprise in this direction and it was agreed that extension of the industry was desirable.

It was recommended that consideration should be given to (a) better and more extensive arrangements for the supply of cheap planting material.

(b) Instruction in methods of cultivation and manufacture.

(c) Methods of marketing.

It was pointed out that Java coffee, which is the chief competitor of Malayan coffee in the local market, is better prepared than the average local product and that if success is to be achieved an improvement in quality is essential.

Arecanuts.

In relation to this export crop, it was considered that improvement could be effected in the quality, grading and marketing of the product. The problem was in many ways similar to the problem of copra, and it was thought that methods adopted for the improvement of the copra industry among small-holders, would, to a large extent, be applicable to the arecanut industry.

It was suggested that information regarding methods of preparation and grading should be disseminated by Malay Agricultural Assistants and Malay Co-operative Officers.

An account of the efforts of the Co-operative Department to organise the co-operative sale of arecanuts from Perak to Penang was heard with interest and it was urged that greater systematisation of these efforts and their extension to other States and Settlements was desirable.

Spices and Pepper.

Memoranda on the above subject stated that the area under spices in Malaya was estimated at about 800 acres, the principal spices grown being cloves, nutmegs, cinnamon and ginger.

It has been shown that cloves could be grown successfully in inland areas as well as on the coast, but the product was considered not capable of immediate extensions owing to the length of time which lapses before trees come into bearing. Increased interest was being shown in the planting of ginger, which gave a quick return.

With regard to pepper it was mentioned that there appeared to be considerable possibilities for the cultivation of this crop for local consumption and for export. It was contemplated to establish pepper gardens in many of the agricultural stations and it was hoped in due course that planting material would be available for distribution.

Groundnuts.

With regard to this crop it was reported that a large number of varieties had been introduced and were being grown experimentally at the Government Experimental Plantation, Serdang.

It was considered that there was scope for the extension of groundnut cultivation, since groundnut oil is an important article of consumption, and it was suggested that further experimental work should be pushed forward energetically with a view to ascertaining whether the development of the industry was a practical possibility.

Sugar.

The Conference was of opinion that even though Malaya was at one time a sugar producing country, sugar production from sugar cane, on a large scale, was not likely to receive attention at the present juncture owing to the depressed condition of the industry. Furthermore, the capital outlay involved in the erection of sugar factories was considerable and success was only possible if Government would adopt a policy of high protection in order to encourage local production.

It was considered, however, that increased quantities of sugar cane for eating purposes could be produced locally in order to replace the cane imported for this purpose from China.

Tea.

The possibility of the cultivation of tea by Malay small-holders was discussed and it was pointed out that in Ceylon, tea was being cultivated by small-holders who sold the freshly plucked leaf to neighbouring estate factories.

It was considered, however, that there was at present a very limited scope for any development in this direction by Malays, but that the ultimate possibilities should be kept in view.

The Conference was informed of the present position of tea cultivation by Chinese and of the market for certain classes of tea consumed by the labouring classes of Chinese in this country.

The Collection of Economic Data concerning Small-Holdings.

This matter was discussed at length on the third day. The subject was introduced by a memorandum prepared by Mr. R. Boyd, M.C.S., of the Co-operative Department in which the present situation was briefly outlined.

It was pointed out that detailed knowledge concerning the economic position of the Malay small-holder was lacking and that the existing statistical information relating to small holdings, obtainable from mukim registers, statistical reports etc. did not go far enough.

It was agreed that collection of detailed economic data was essential as a basis for operation in efforts to improve the economic position of small cultivators and that in any schemes for collection of such data, the possibility of using existing organisations where possible, should be borne in mind.

It was stressed that the utility of the information to be collected should be carefully scrutinised so that only data with an immediate and direct application should be dealt with in the earlier stages.

It was suggested that a small committee should be formed to examine the position in all its aspects, and to present recommendations to Government with a view to inaugurating the work.

Organisation of District Economic Boards.

A memorandum on this subject by Mr. R. Boyd was discussed. The memorandum explained that the underlying idea of such Boards was to correlate the activities of the District Officers and the specialised Departments in any work affecting the welfare of the raiat. It pointed out that in each District there were representatives of various Departments and that in order to avoid lack of unity, confusion of policy and overlapping, small District Economic Boards should be formed with a nucleus consisting of the District Officer (Chairman), the local Agricultural Officer and the local Co-operative Officer.

It was agreed that some form of organisation was desirable to fulfil the general objects set out in the memorandum and it was suggested that it should be left in the first instance, to the initiative of District Officers to make suitable arrangements in this connection.

The Conference was informed of certain steps which had already been taken in the Districts to achieve the object sought.

Attention was also directed to the benefit which may follow the establishment of mukim committees subsidiary to the District organisations.

The Improvement of Marketing Conditions and Financial Arrangements among Malay Small-Holders.

A memorandum on this subject by Mr. R. Boyd had been circulated. In the memorandum it was pointed out that most of the internal marketing in Malaya was in the hands of Chinese, and that before attempting to alter existing arrangements, full information should be sought and the data obtained carefully weighed in order to find out the present position and the possibilities of improving marketing conditions for the benefit of the Malay small-holder. The difficulties to be expected were explained and reference was made to the efforts of the Co-operative Department in this direction and the experience gained which showed

the necessity for beginning operations on a small scale in order to educate the peasantry gradually in the principles of co-operative marketing.

In this connection it was agreed that the avenue of approach which probably held out the greatest likelihood of early success, was the organisation of small groups of raiats for the manufacture, grading and marketing of certain produce in which efforts should be made to apply sound methods on accepted co-operative lines, without, however, repressing individual ideas and enthusiasm.

With regard to the provision of capital in connection with small marketing organisations, it was realised that while this may at times be a source of difficulty, means could generally be found to overcome the difficulty in a variety of ways and that lack of capital should not form an insuperable obstacle to the inception of such projects.

It was also considered that the necessity for accumulating economic data in respect of conditions in particular areas should be regarded as a preliminary to action and of fundamental importance.

Agricultural Shows.

Memoranda on Agricultural Shows and Home Gardens competitions had been prepared by the Director of Agriculture and circulated. The points raised in the memoranda were discussed at the administrative session on the fourth day.

It was agreed that the holding of Agricultural Shows was desirable, especially during the present period of depression, since such shows exercised an important influence on the quality of the produce grown and also constituted a very important means of disseminating information and fostering competition. The necessity for exercising the most careful economy in this as in other directions was recognised.

It was further considered that the exact form which such shows should take could, to an extent, be left to the judgment of individual District Officers who would consult with the district organisations on the subject.

It was thought that the visit of the Rural Lecture Caravan might usefully be made to coincide with such exhibitions whenever it could be arranged, while the possibility of transporting exhibits of outstanding interest from one exhibition to another on successive days, was worthy of careful consideration.

The question of holding periodically, small competitions in connection with weekly fairs was also mentioned and it was considered that such competitions would probably be of considerable value, while weekly fairs themselves should by all means be encouraged.

It was recommended that the practice of providing special displays and demonstrations concerning subjects and methods likely to improve or increase the production of particular crops and also on subjects concerning the health and general welfare of the raiat should not be discontinued. It was thought, however, that regional selectivity should be exercised in providing such displays and demonstrations so as to ensure that they would appeal to the particular audience concerned, having regard to local conditions and activities.

Home Garden Competitions.

In connection with Home Gardens competitions, it was explained that the movement had taken the form of an extension from School Gardens, the idea being that the pupils, by bringing the information concerning gardens which they had learned at school, into the home circle, might exercise an influence on the community as a whole. It was reported that the movement had already undergone considerable extension in the areas where such competitions had been started, and it was suggested that its extension to all parts of the Peninsula should now be considered and that rules for the conduct of such competitions should be drawn up.

Land Tenure by Malay Small Cultivators.

The question of revision and extension of the methods at present employed for alienation of land to Malay cultivators, and the making of surveys in connection therewith, was discussed.

It was mentioned that at the present time, the cost of the accurate survey required in order to obtain proprietary rights over an area of land was likely to prove an obstacle to the development of new areas by Malay small-holders.

One of the chief proprietary rights was the right to borrow money on the security of the land, and in the past much land had been developed by the small-holders on money obtained in this way. On the other hand, considerable sums of money were obtained for uneconomic purposes.

It was suggested that consideration by Government of the present cost of surveys, and of the necessity for the present standard of accuracy, would be welcomed.

Agriculture on Chinese Small-Holdings.

A memorandum on Chinese agriculture had been prepared by the Chief Field Officer.

The memorandum pointed out that Chinese small-holders produced nearly all the local supplies of vegetables and fruit, and that they also provided a large proportion of the locally bred pigs and considerable quantities of poultry and eggs.

In order to get in touch with the Chinese small-holders, who as a rule do not speak Malay, the employment of Chinese officers was found to be essential. Three such officers were appointed to the staff of the Department of Agriculture and have collected much useful information concerning the agricultural activities, methods, systems of marketing etc. of Chinese small-holders. They have also rendered these small-holders valuable assistance in several ways, notably in matters relating to the obtaining of new land when moved, assisting them to settle on new areas, distributing good planting material, coupled with instruction and demonstration in improved methods of cultivation and preparation of certain crops such as tea, coffee and tobacco. Considerable interest had also been

aroused in connection with the improvement of local pigs by demonstrations and help from the Department of Agriculture's stock farm at Serdang. It was mentioned that while the Chinese market gardeners had little to learn as regards the actual cultivation of vegetables, they often employed objectionable methods of manuring and, in order to bring about an improvement in this respect, work was at present being done to test cheap and efficient methods of manuring not open to any objection.

The Conference agreed that on general grounds it was very desirable to restrict the use of night soil in vegetable cultivation but it was pointed out that the substitution of other and dearer manures might result in an increase in the market price of vegetables.

With regard to the improvement of marketing amongst Chinese small-holders, it was apparent that rings and combines exist among Chinese middlemen which operate adversely to the producers, in much the same way as in the case of the Malay raiats. It was mentioned that the difficulties in the way of organising Chinese small-holders to combat such rings were very considerable, owing to a variety of causes, and it was felt that further economic investigation into their condition was required before any definite action was taken.

In connection with the question of land alienation to Chinese small-holders, reference was made to certain localities where suitable land had been earmarked for Chinese market gardens, close to town and with transport available, on which communities of Chinese market gardeners had been settled. It was pointed out that in several parts of the country market gardeners had done valuable service by reconditioning for agriculture, considerable areas of worked-out mining land.

The necessity for a uniform policy with regard to alienation of land with better security of tenure, was considered to be desirable, and it was thought that if an increased number of longer leases with possibility of renewal were given to genuine market gardeners, the growing of permanent crops by these people would be encouraged.

It was recognised that the Chinese agricultural publication of the Department of Agriculture was serving a useful purpose and it was suggested that the dissemination of similar information through the medium of Chinese vernacular newspapers might also be undertaken.

Conclusion.

The discussion on Chinese agriculture brought the proceedings of the Conference to a close on Saturday August 6th.

On the preceding day, the Hon'ble the Acting British Resident, Selangor, in closing the discussion on the day's proceedings, mentioned that he thought it would be a pity if such a Conference was never to be held again. Although he had been unable to attend all the sessions of the Conference, the sessions which he had attended and the results which had been obtained, satisfied him

that the holding of such Conferences was very desirable and that the resolutions passed were both useful and necessary.

He then moved the following formal resolution:—

“The members of this Conference desire to thank Dr. H. A. Tempany and Mr. A. Cavendish for having called the Conference into being and for the labour undertaken to bring it to a successful termination and they also express the hope that such conferences will be held in future whenever there are matters to warrant them.”

In seconding the motion, Mr. E. B. Williams, M.C.S., Commissioner of Lands, Federated Malay States, said that he realised that the District Officer was not the only friend of the small-holder and that an enormous amount of work was being done for the benefit of the small-holder by officers of the Departments of Agriculture and Co-operation. He felt that the members owed a great debt of gratitude to Dr. Tempany and Mr. Cavendish and also to the various officers who had written the various memoranda and he wished to add a special note of thanks to Messrs Thompson, Blacker and Steynes, for the Secretarial work they had performed. Dr. Tempany, Mr. Cavendish and Che Patch Akhir having replied to the motions, the latter on behalf of the Malay members, the Conference was declared adjourned.

ERRATUM.

Acreages out of Tapping in Netherlands India.

The figures published under this heading in the September 1932 issue of this journal, for the acreages out of tapping in Netherlands India during January, were incorrect; the amended statement is as follows:—

January.	A Totally Ceased		B Partly Ceased		Totals A & B		
	Estates	Area in Acres	Estates	Area in Acres	Estates	Areas in Acres	
Java and Madoera	...	99	35,679	47	11,757	146	47,436
Outer Provinces	...	70	24,912	67	25,214	137	50,126
Netherlands India	...	169	60,591	114	36,971	283	97,562

FROM THE DISTRICTS.

September, 1932.

The Weather.

In the greater part of the Peninsula the weather during the first two weeks of September was hot and dry, while in the second half of the month, showers varying in number and intensity, were experienced. In Penang and Province Wellesley, however, the whole month was very wet, 8 inches of rain falling in 48 hours on the 22nd. and 23rd. and causing flooding in many localities. Heavy rain fell in Krian District at the same time. In Southern Perak and Selangor, rainfall was lighter, but showers were fairly frequent in some places especially towards the end of the month. On Cameron Highlands and in the Negri Sembilan, the middle of the month was dry and the remainder showery, while in Malacca there were heavy showers, with dry intervals in the coastal belt. In Southern Johore and Singapore Island, rainfall was very variable in different localities.

Remarks on Crops.

Rubber.—The price of rubber continued to rise in the early part of September, but declined again later in the month, the uncertainty of the market being reflected in small but rapid fluctuations, which caused some speculation on the part of local dealers in some districts. Price ranges for rubber produced on small holdings were: for smoked sheet \$6.00 to \$13.50, for unsmoked sheet \$5.00 to \$13.00 and for lower grades \$1.00 to \$6.50 per picul. In Singapore the corresponding average prices were \$9.75, \$8.50 and \$3.40 per picul respectively.

The enhanced price, combined in some districts with the completion of padi planting, led Malay owners of untapped rubber holdings in most parts of the country, except the Krian and Selama Districts of Perak and the State of Selangor where padi planting or harvesting were in progress, to recommence tapping their trees. On the great majority of such holdings, tapping once begun was continued throughout the month in spite of the decline in the price of rubber. The increased price was not sufficient to induce the Chinese and Indian owners of properties of intermediate size to tap their trees again, except in parts of Perak South and Selangor, while even on some of these properties, work was soon stopped when the price declined.

Mouldy Rot disease became considerably more prevalent with the incidence of wetter weather and the resumption of tapping. It was found for the first time in the State of Kelantan in three localities near Kota Bahru.

Padi.—The local prices of padi remained at 6½ to 15 cents per gantang in different parts of the country. In Kelantan, Kedah, Penang and Province Wellesley, northern and central Perak and the coast of Malacca, cultivation and transplanting operations progressed well as soon as the water supply became

sufficient. Planting was, however, again delayed by floods in some parts of Province Wellesley.

Planting in the Negri Sembilan, except Kuala Pilah District, was completed, as it was also in the inland areas of Malacca and throughout Western Pahang, where there were prospects of a satisfactory crop.

In Selangor, the inter-season crop was being harvested and appeared on the whole to be a success, but in some localities it did not come up to earlier expectations owing to the large proportion of empty ears. This is, in part, accounted for by the attacks of birds and the padi-fly, *Leptocorisa acuta*, but may also be due in part to other, more obscure causes. Elsewhere in Selangor the main crop was being planted and good progress was made with the establishment of nurseries and the clearing of the timber on the new padi areas in Kuala Selangor District. The Department obtained some 13,700 gantangs of seed padi for use in these new areas, mainly from Krian and Province Wellesley. About 4,000 gantangs of this consisted of seed of different pure strains, while the balance was mixed seed.

In Johore, the growth of the padi, on the whole, was good, though in places it was suffering from drought. Harvesting of both wet and dry padi was commenced in some localities. Crop prospects were fair.

A water gate was supplied in each of the padi areas in the Dindings where bunds were constructed by communal work; as a result, much rain water was conserved.

In Kedah, padi growers, working under the supervision of the Irrigation Department, have constructed a water channel three miles long which supplies about 1,400 acres of land at Sala Kanan. In the mukim of Tubir they have constructed, with the aid of a small Government subsidy, a second channel two miles long supplying some 2,100 acres. At Sungei Lemau in Yen District, a substantial bund 4 feet high and four miles long was constructed by communal work.

Coconuts.—Progress has been made by Malays in the preparation of copra from their own nuts, as is shown elsewhere in this number.

In view of the shortage of locally grown nuts in Kuala Lipis District of Pahang and the surplus production in Temerloh District, a trial consignment of 500 nuts was sent from Temerloh to Kuala Lipis. The consignment sold for a price, which after deducting the cost of transport, gave a better return to the growers than could be obtained at the price ruling in Temerloh District.

The outbreaks of *Artona catoxantha* in Perak and Selangor terminated; the insects in Selangor became much less numerous after a heavy rain storm.

There was a slight rise in the general range of local prices for small-holders' copra, which varied from \$3.80 to \$6.00 per picul.

Tobacco.—The area planted with this crop is increasing in Kedah, Province Wellesley, and parts of Perak and Johore. In Malacca, it is now well established and extending in the inland districts.

A crop of leaf grown at the Pineapple Experiment Station in Singapore Island and cured with toddy, sold for \$60 per picul. Prices for dried and cut leaf in other parts of the country have shown little change from those ruling during August.

Pineapples.—In Selangor, an additional 750 acres and a number of small holdings were planted with this crop during the month, while in Johore, the planting of pineapples as a sole crop was noticeable in certain new areas.

In Johore, small supplies of fruit were available and one factory was working during the month. In the same State a large, new, up-to-date factory is approaching completion.

Malaya continues to enjoy a virtual monopoly of the United Kingdom market for canned pineapples, providing, during the seven weeks ending on the 3rd. September, about 96 per cent. of the total imports.

Fruit.—The fruit season in Kelantan was much later than elsewhere in the Peninsula. During the month durians were still obtainable while mangosteens, langsat and rambutans were ripening. In Johore, dukus were still plentiful. In Penang and Province Wellesley, Perak and Selangor, durians, mangosteens and rambutans were in flower and gave promise of a good secondary crop of fruit, in spite of the good harvest obtained earlier in the year.

Agricultural Stations and Padi Test Plots.

KELANTAN. *Pasir Puteh Padi Experiment Station.*—This station suffered from a severe attack of grass-hoppers spreading from adjoining land which could not be planted owing to drought; however, seedlings in the dry nurseries were suffering so much from lack of water that it was necessary to transplant them before they were sufficiently developed. These factors may adversely affect the results of the trials on this Station, but the grass-hopper attack emphasised the greater vigour of the padi on certain of the manured plots.

It was recorded in certain instances last season that applications of manures produced an improvement in the vegetative growth of padi which was most noticeable soon after transplanting. Such improvement has been recorded again during this month, both on nursery seedlings and on recently transplanted manured plots. Last year it was found that the improvement gradually became less obvious as the padi grew older, until it practically disappeared and that at harvest the increased yield on the manured plots over the controls was profitable in only one or two instances and was not even significant in some cases. Consequently, it will be of interest to observe if these recorded instances of improved vegetative growth are followed by profitably higher yields from the manured plots in the present season.

PENANG AND PROVINCE WELLESLEY. *Glugor Padi Test Plot.*—The second inter-season crop was again a failure owing to the concentrated attacks of birds on the only ripe grain in the neighbourhood. Furthermore, a flood on the surrounding cleared padi land drove numbers of rats to take refuge in the only

growing crop standing above the water and, as soon as the floods subsided, to destroy many of the plants.

Work on other padi Test Stations progressed normally. Wetter weather enabled planting operations to be undertaken on the various Agricultural Stations, more especially on the plots for permanent crops such as coffee, tea, fruit trees, bananas, pineapples and pepper on the newer stations at Selama in Perak, Cheras in Selangor, Rembau in Negri Sembilan, Temerloh in Pahang and Sungei Udang in Malacca.

CAMERON HIGHLANDS. *Tanah Rata Experimental Plantation*.—During the month, work on the pruning programme in the mature tea was in progress and manures were being applied to the pruned fields.

All plots required for an approved scheme of manurial and pruning experiments with tea have been marked out in the planted areas as well as in one field in the new clearing on which a planting distance experiment is to be conducted. Preliminary yields have been taken from the separate plots in the fields of mature tea.

A manurial experiment with bearing coffee has been marked out and the first application of manures has been made.

Plots have been prepared for cultivation and manurial experiments with potatoes.

Village Fairs and Markets.

During the month, 11 new village fairs opened for the first time in Kedah, Selangor, Negri Sembilan and Johore. The rapidly increasing popularity of these institutions is sufficient proof of their success. A new departure is the opening of a market in Ulu Selangor for the sale of vegetables by school children only and this has done much to encourage keenness in the pupils' home gardens. The fairs at Serendah and Kuala Kubu in Ulu Selangor have suffered from severe competition from the Chinese market sellers. In Johore a two day market was started for the first time at Buloh Kasap and proved a great success; it is intended to make this a permanent monthly institution.

Egg Marketing in Krian.—The egg selling scheme of the Tebok Haji Musa Rural Credit Society, under the direction of the Co-operative Department, is rapidly increasing in prosperity, its products being transported for sale in the Kuala Lumpur market. Two cocks, cross-bred from Rhode Island Red and local fowls, are being ordered from the Kuala Kangsar agricultural station with the object of improving the Krian stock.

DEPARTMENTAL NOTES.

Native Production of Copra.

The efforts of the Department of Agriculture to improve the quality of copra from small holdings by encouraging the erection of more efficient kilns and by giving instruction to the native producers in the method of preparation on such kilns, have been extended in several directions, with encouraging results.

In this connection, on September 21st, 1932 a meeting was held at the Coconut Selection and Experiment Station, Klang, of "penghulus" and "ketuas" (local headmen), and Malay copra manufacturers from the three coastal districts of Selangor, for the purpose of discussing the best methods of organising and marketing Malay-produced copra to meet the demands of important European buyers. The meeting was well attended, about 100 people being present, including administrative officers from Klang and Kuala Selangor Districts and representatives of the Department of Agriculture.

An interesting discussion took place, in which recent improvements in marketing and the influence of this new organisation on local prices were contrasted with the condition of the local industry a short time ago. Various questions were brought up for discussion by the Malays.

It was finally decided that the delegates should discuss the various aspects of the problem with Malay producers throughout the Districts, with the object of deciding upon a system of collective selling of the improved copra now being produced.

In Province Wellesley three improved kilns are in course of erection under the guidance of the Malay Agricultural Officer.

Small-holders in the Bagan Datoh District of Lower Perak, realise that it is more profitable to make copra than to sell nuts. The tendency in this District at present, is for individuals to build their own kilns rather than to work in groups with a communal kiln of good design. Consequently, the development in this area requires closer direction.

In Pahang, preliminary enquiries have been made in the Temerloh District as to the possibility of erecting a small kiln of improved type. The suggestion has been well received and is likely to result in action in the near future.

In Johore, the Principal Agricultural Officer delivered a lecture on copra production to Malays at Pontian Kechil, Kukub District. As a result, proposals have been made for the erection of three experimental kilns in this District.

Demonstrations at Padi and Agricultural Stations in Selangor.

During September, demonstrations were held, for Penghulus and village headmen, at the Padi Station—Kuang, the Coconut Experiment and Selection Station—Klang, the Experimental Station—Cheras, and at the Experimental Plantation—Serdang. Three parties of Penghulus visited the Kuang Padi Station on different dates and particular interest was shown in the short matura-

tion strains by the Penghulus from Ulu Selangor, who after seeing the good crops obtained there, expressed their willingness to advocate twice-yearly planting again in the following year, in their several districts. A number of Penghulus and village headmen from Kuala Lumpur, who visited the Cheras Agricultural Station, took considerable interest in the results of manurial trials, tobacco cultivation and kapok budding.

On the 21st. of the month, over one hundred Penghulus and headmen attended the meeting at the Government Coconut Station—Klang, in order to discuss copra marketing problems. An improved type of kiln was demonstrated to them and the details of copra production and marketing were explained. It is interesting to note that, as a direct result of this meeting, all coconut and copra prices were raised by Chinese dealers in the locality in order to discourage the Malays from entering into competition with them.

Two parties of Penghulus, from Klang and Ulu Langat, were conducted over the Government Experimental Plantation—Serdang, on different dates and shown the various economic crops, factories, and the stock farm. Considerable interest was evinced in the methods of fruit propagation which were demonstrated.

Home Gardens Competition in Selangor.

A competition, organised by the Malay Agricultural Officers, Penghulus and Visiting Teachers, for the best gardens cultivated in the homes of Malay school pupils, was held for the first time in Ulu Selangor and Kuala Selangor. Considerable keenness was aroused, as the number of entries and the high standard of the winning gardens proved. The home gardens in Ulu Selangor are decidedly the best in the State.

Rural Lecture Caravan.

In September, the Rural Lecture Caravan, after its return from the Negri Sembilan, commenced a tour of Perak which opened at Simpang, near Taiping, on September 19th. Lectures, film displays and demonstrations were also held at Trong and Padang Gajah, after which the Caravan proceeded to the Dindings from the 22nd. to 26th. Owing to a breakdown after leaving Sungei Batu, which necessitated the fitting of spare parts obtainable from Ipoh, visits to Segari and Lumut had to be abandoned. After visiting Bruas and Manong, the film projecting equipment and exhibits were embarked on a houseboat at Kuala Kangsar on the 29th. for an extensive tour through the riverine mukims of Perak.

Leave.

Mr. J. S. Nornam, Field Instructor and Superintendent, School of Agriculture, Malaya, has been granted 5 months and 15 days leave on full pay, from 16th. September, 1932, prior to the termination of his appointment.

Statistical. MARKET PRICES.

September, 1932.

Rubber.—The price of rubber has fluctuated in Singapore during September from 9 13/16 cents per lb. to 7 5/16 cents per lb., the average price for the month being 8.38 cents per lb. as compared with 7.41 cents per lb. in August. The average London price in September was 2.71d. per lb., and New York 3.77 cents (gold) per lb., as compared with 2.44d. and 3.56 gold cents per lb. respectively in August.

Palm Oil.—The following weekly quotations of palm oil c.i.f. Liverpool, on a basis of 18 per cent. f.f.a. have been received during September: 1st. £17, 8th. £18.5.0, 15th. £18.15.0, 22nd. £18.10.0, 29th. £18.5.0. For the most part the market has been reported as quiet.

Copra.—The Singapore market has continued steady, all supplies being readily absorbed. Prices have shewn but small fluctuations. The average price of Sundried was \$5.76 per picul as compared with \$5.55 in August, while Mixed averaged \$5.27 per picul as compared with \$5.04 per picul in the previous month.

Coffee.—Further improvement in coffee prices is recorded during September. Palembang coffee averaged \$19.30 per picul as compared with an average price of \$17.25 in August. Sourabaya coffee averaged from \$23.60 to \$26.20 per picul, the price within this range depending upon quality. The average price of Sourabaya coffee in August was \$22.37 to \$24.01 per picul.

Areca nuts.—Palembangs have remained steady at around \$3 per picul, the average Singapore price for September being \$2.98 per picul. Bila Whole averaged \$3.18 per picul as compared with \$3.25 in August. Average Singapore price per picul of other grades in September were:—Splits \$5.60 to \$8; Red Whole \$6.05 to \$7.10; Sliced \$7.25 to \$8.50; Kelantan Splits \$8.30 to \$9, the price within each range depending upon quality.

Rice.—The following are the average wholesale prices of rice per picul in Singapore during August: Siam No. 2 \$3.88 as compared with \$3.96 in July; Rangoon No. 1, \$3.60 as compared with \$3.73 in July.

The average retail market prices in cents per gantang of No. 2 Siam rice in August were:—Singapore 28, Penang 31, Malacca 28 as compared with 28, 33 and 28 respectively in July.

Gambier.—Block gambier remained at \$6 per picul. Cube No. 1 improved 50 cents to \$12 per picul, the average price for the month being \$11.90 as compared with \$11.62 in August.

Pineapples.—The Singapore market has been lifeless. Buyers are stated to display no interest in the new "pack" as yet. Average prices per case during September were:—1½ lb. cubes \$3.18; 1½ lb. sliced flat \$3.38; 1½ lb. sliced tall \$3.50, as compared with \$3.06, \$3.32 and \$3.42 in August.

Tapioca.—The market has been steady for all descriptions and prices have advanced. Average Singapore quotations per picul during September were:—Flake, fair \$3.33; Pearl, seed \$3.98; Pearl, medium \$4.17, as compared with \$3.15, \$3.87 and \$4.00 respectively in the previous month.

Sago.—Conditions in the consuming markets are firm and local values have shewn some advance. Average Singapore prices per picul in Singapore during September were:—Pearl, small, fair \$4.27 as compared with \$4.25 in August; Flour, Sarawak, fair \$2.27 against \$2.05 in August.

Mace and Nutmegs.—Shortage of supplies have caused nominal prices to advance appreciably. Average Singapore prices per picul for mace during September were:—Siouw \$64, Ambionia \$43.60 as compared with \$48.25 and \$34.75 respectively in August.

Nutmegs 110 per lb. \$23.20, and 80 per lb. \$32.80 per picul as compared with \$22.50 and \$29.50 per picul respectively for the previous month.

Pepper.—Arrivals have been plentiful so that prices tend to be easier. Average Singapore prices per picul in September were:—Singapore Black \$19.10; Singapore White \$25.35; Muntok White \$25.90 as compared with \$18.06, \$24.19 and \$24.65 in August.

Cloves.—Singapore stocks are light, causing some appreciation in nominal quotations. Average Singapore prices per picul in September were:—Zanzibar \$42 and Amboina \$45.60, as compared with \$40.25 and \$42.25 respectively in August.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm Oil reports are kindly supplied by Messrs. Cumberbatch & Co., Ltd., Kuala Lumpur, the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore.

1 picul = 133½ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural products. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY. *

August, 1932.

Malaya.—Gross foreign imports of rice during August, 1932, amounted to 47,430 tons as compared with 67,862 tons in August, 1931, of which 44.9 per cent. were consigned to Singapore, 16.3 per cent. to Penang, 10.3 per cent. to Malacca, 20.8 per cent. to the Federated Malay States, and 7.7 per cent. to the Unfederated Malay States.

Of these imports 65.1 per cent. were from Siam, 32.9 per cent. from Burma, 0.9 per cent. from French Indo-China and 1.1 per cent. from Other Countries.

Total foreign exports of rice in August, 1932, were 15,861 tons (including 177 tons domestic production, exported from Penang) as compared with 14,480 tons in August, 1931. Of these exports 86.5 per cent. went to Netherlands India 13.5 per cent. to Other Countries.

Net Imports for the period January to August, 1932, were 267,135 tons as compared with 361,578 tons for the same period of 1931, a fall of 26.1 per cent.

India.—Total foreign exports of Rice (*Indian Trade Journal* 1.9.32) during July, 1932, were 119,000 tons as compared with 182,000 tons in June, 1932, and 165,000 tons in July, 1931, decreases of 34.6 per cent. in respect of the previous month and 27.9 per cent. in respect of the same period of the previous year.

Total exports during the period January to July, 1932, were 1,537,000 tons as compared with 1,411,000 tons for the corresponding period of 1931, an increase of 126,000 tons or 8.9 per cent.

Total exports of rice and bran from Burma for the period January 1 to August 27, 1932, amounted to 2,342,516 tons as compared with 2,770,801 tons for the corresponding period of 1931 or a decrease of 15.5 per cent. Of these exports 641,397 tons went to India in 1932 as compared with 1,174,563 tons in 1931, a decrease of 45.4 per cent.

Japan.—The *Trans-Pacific Journal* dated August 18, 1932, states that according to the Ministry of Agriculture and Forestry, stocks of rice in Japan (Proper) on August 1 amounted to 2,734,200 tons.

The anticipated balance on November 1, including imports from Korea and Formosa is now estimated at 748,027 tons.

Siam.—Exports (approximate) of rice from Bangkok during July, 1932, amounted to 100,684 tons as compared with 94,153 tons in July, 1931, or an increase of 6.9 per cent.

Exports of rice from Bangkok during the period December 1931, to July 1932, (the figures for June and July 1932 being approximate) amounted to 966,164 tons, an increase of 143,164 tons or 17.4 per cent. as compared with the same period of 1930—31.

* Abridged from the Rice Summary for August, 1932, compiled by the Department of Statistics, S.S. and F.M.S.

At the end of June 1932 (Principal Trade Commissioner, Ministry of Commerce and Communications, Bangkok) the area under padi in 28 provinces amounted to 1,034,565 acres as compared with 1,466,772 acres at the same time last year or a decrease of 29.5 per cent.

The area under padi for the season 1931—1932 in Siam (whole Kingdom) was 7,726,974 acres as compared with 7,950,208 acres the previous year, a decrease of 2.8 per cent. The total production was 4,036,238 tons as against 4,787,997 tons a year ago.

It is also reported that the total exportable surplus on the 1st of August, 1932, amounted to 306,000 tons of rice.

Netherlands India.—Java and Madura. The *Korte Berichten* of August 26, 1932, states that at the end of July, 1932, the area harvested amounted to 7,712,250 acres, an increase of 243,250 acres or 3.3 per cent. as compared with the same period of 1931, the area damaged to 300,270 acres, a decrease of 112,581 acres or 27.3 per cent. as compared with 1931 and additional plantings awaiting harvest to 1,316,000 acres an increase of 187,250 acres as compared with 1931, a total of 9,328,520 acres as compared with 9,010,601 acres for the same period of 1931, an increase of 3.5 per cent.

Imports of rice into Java and Madura during January to July, 1932, totalled 99,050 tons as compared with 172,959 tons for the same period of 1931 or a fall of 42.7 per cent.

Imports of rice into Outer Provinces during January to June, 1932, totalled 123,267 tons as compared with 169,886 tons for the same period of 1931 or a fall of 27.4 per cent.

French Indo-China.—Entries of padi at the port of Cholon from January 1, 1932, to August, 1932, amounted to 809,680 (metric) tons, an increase of 2,460 tons or 0.3 per cent. as compared with the same period of 1931.

Exports of rice from Saigon for the period January 1, 1932, to August 31, 1932, amounted to 824,637 (metric) tons an increase of 92,962 tons or 12.7 per cent. as compared with the same period of 1931.

Ceylon.—Imports for 7 months to July 31, 1932, were 265,679 tons, an increase of 13,370 tons or 5.3 per cent. as compared with 1931.

Of these imports, 19.9 per cent. were from British India, 69.1 per cent. from Burma, .3 per cent. from the Straits Settlements and 10.7 per cent. from Other Countries.

Europe and America.—Quantities of rice shipped from the East were:—

- (a) To Europe, period January 1 to August 18, 1932, 670,957 tons as compared with 802,802 tons for the same period of 1931, a decrease of 16.4 per cent. Of the 1932 shipments 59.3 per cent. was from Burma, nil from Japan, 33.3 per cent. from Saigon, 3.8 per cent. from Siam and 3.6 per cent. from Bengal, as compared with 67.3 per cent. from Burma, 3.0 per cent. from Japan, 20.4 per cent. from Saigon, 6.3 per cent. from Siam and 3.0 per cent. from Bengal in 1931.

- (b) To the Levant, period January 1 to July 13, 1932, 42,475 tons, an increase of 2,435 tons or 6.1 per cent. as compared with the same period of 1931.
- (c) To the West Indies and America, period January 1 to July 25, 1932, 89,119 tons, a decrease of 18,036 tons or 16.8 per cent. as compared with the same period of 1931.

The *International Crop Report*, Rome, for August, 1932, states as follows :—

“ Italy : The area planted to rice this year is estimated at 341,000 acres against 356,000 acres in 1931 and 350,000 in 1926—30.

United States : Reductions in area have been substantial in all States, mostly because of market conditions. Total area is estimated at 845,000 acres against 974,000 acres in 1931, a decrease of 13.2 per cent. and 962,400 acres on the average of 1926—30, a decrease of 12.2 per cent. Production is estimated at 785,700 tons against 908,500 tons in 1931, a decrease of 13.5 per cent., and 866,100 tons on the average of 1926—30, a decrease of 9.3 per cent.”

ACREAGES OF TAPPABLE RUBBER OUT OF TAPPING IN NETHERLAND INDIA AT END JULY, 1932.

		A Totally Ceased		B Partly Ceased		Total A & B	
		Estates	Area in Acres	Estates	Area in Acres	Estates	Area in Acres
Java and Madoera	...	243	148,904	49	18,416	292	167,320
Outer Provinces	...	207	92,356	62	30,541	269	122,897
Netherlands India	...	450	241,260	111	48,957	561	290,217

The total area for July amounts to 31 per cent. of the total tappable area as at the end of December, 1931.

Abstracted from *Korte Berichten*.

ACREAGE OF TAPPABLE RUBBER OUT OF TAPPING ON ESTATES OF 100
ACRES AND OVER, MALAYA, AT END OF AUGUST, 1932.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1931	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING		Total (3) + (5)	Percentage of (7) to (2)
		Acreage (3)	Percentage of (3) to (2) (4)	Acreage (5)	Percentage of (5) to (2) (6)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FEDERATED MALAY STATES :—							
Perak	238,420	21,228	8.9	30,223	12.7	51,451	21.6
Selangor	294,030	24,250	8.2	37,679	12.8	61,929	21.1
Negeri Sembilan	217,002	22,937	10.6	22,419	10.3	45,356	20.9
Pahang	35,122	8,460	24.1	4,540	12.9	13,000	37.0
Total F.M.S. ...	784,574	76,875	9.8	94,861	12.1	171,736	21.9
STRAITS SETTLEMENTS :—							
Province Wellesley	44,055	3,434	7.8	10,047	22.8	13,481	30.6
Dindings	6,700	754	11.3	1,105	16.5	1,859	27.7
Malacca	110,288	5,879	5.3	22,690	20.6	28,569	25.9
Penang Island	1,585	1,259	79.4	44	2.8	1,303	82.2
Singapore Island	28,033	13,885	49.5	3,501	12.7	17,446	62.2
Total S.S. ...	190,661	25,211	13.2	37,447	19.6	62,658	32.9
UNFEDERATED MALAY STATES :—							
Johore	313,385	44,537	14.2	35,241	11.2	79,778	25.5
Kedah (a)	114,254	9,038	8.4	4,616	4.0	14,254	12.5
Kelantan	16,785	6,184	36.8	1,590	9.5	7,774	46.3
Trengganu (b)	4,300	mil	mil	1,072	48.2	2,072	48.2
Perlis	903	177	19.6	426	47.2	603	66.8
Total U.M.S. ...	449,627	60,536	13.5	43,945	9.8	104,481	23.2
TOTAL MALAYA ...	1,424,862	162,622	11.4	176,253	12.4	338,875	23.8

Notes :—1. (a) Registered companies only and are rendered quarterly, commencing with June 1931.

(b) Registered Companies only.

The above table was prepared by the Statistics Department, S.S. and F.M.S.

MALAYAN AGRICULTURAL EXPORTS, JULY, 1932.

Product.	Net Exports in Tons				
	Year 1931	Jan. to July 1931	Jan. to July 1932	July 1931	July 1932
Arecanuts ...	19,266	12,595	14,096	1,348	615
Coconuts, fresh ...	10,468	4,720	74,272†	917	10,485†
Coconut oil ...	9,909	5,939	6,097	982	910
Copra ...	100,809	47,042	42,716	5,916	5,662
Gambier, all kinds ...	2,563	1,478	1,773	238	271
Palm kernels ...	726	301	591	19	65
Palm oil ...	4,574	2,033	3,813	208	637
Pineapples, canned ...	59,457	41,029	45,006	6,196	7,804
Rubber ...	434,857	246,048	235,677	37,046	35,356
Sago,—flour ...	5,608	1,159	4,139	380*	1,049*
„ —pearl ...	2,429	1,128	1,401	221	173
„ —raw ...	2,904*	1,072*	2,432*	214*	352*
Tapioca,—fresh ...	9,742	6,507	5,276	1,510	755
„ —flour ...	491*	11*	259*	80*	96*
„ —pearl ...	19,006	10,786	11,902	1,432	1,455
Tuba root ...	74	36	63	4	13

† '000 in number.

* Net imports.

MALAYAN AGRICULTURAL EXPORTS, AUGUST, 1932.

PRODUCT	Net Export in Tons				
	Year 1931	Jan-Aug 1931	Jan-Aug 1932	August 1931	August 1932
Arecanuts ...	19,266	13,076	13,615	554	481*
Coconuts, fresh ...	10,468	5,325	83,244†	605	8,972†
Coconut oil ...	9,909	6,640	7,322	701	1,225
Copra ...	100,809	60,774	55,185	13,732	12,469
Gambier, all kinds ...	2,563	1,764	2,103	286	330
Palm kernels ...	726	324	752	23	161
Palm oil ...	4,574	2,314	4,547	281	734
Pineapples, canned ...	59,457	45,334	50,729	4,305	5,723
Rubber ...	434,857	282,095	272,085	36,047	36,408
Sago,—flour ...	5,608	1,461	5,226	302	1,087
„ —pearl ...	2,429	1,408	1,888	280	487
„ —raw ...	2,904†	1,140†	2,696†	68†	264†
Tapioca,—flake ...	9,742	7,020	6,325	513	1,049
„ —flour ...	491†	24	190†	35	69
„ —pearl ...	19,006	12,754	13,912	1,968	2,010
Tuba root ...	74	41	83	5	20

* '000 in number.

† net imports.

TABLE I
MALAYA RUBBER STATISTICS
STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX,
FOR THE MONTH OF AUGUST, 1932 IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of less than 100 acres and over			Production by Estates of less than 100 acres estimated 2			Imports			Exports including re-exports			Stocks at end of month		
	Ports	Dealers	Estates of 100 acres and over	during the month 1932	during the month	during the month	during the month 1932	during the month	during the month	Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES:—																		
Federated Malay States ...	...	14,443	12,857	11,695	94,194	7,575	59,561	Nil	Nil	Nil	Nil	14,304	5,397	109,310	47,676	...	14,978	11,866
Johore ...	...	2,834	3,265	3,691	29,189	4,709	27,942	Nil	8	Nil	45	1,130	7,070	7,940	48,788	...	2,957	3,850
Kedah ...	...	663	2,042	2,443	18,301	1,216	7,093	Nil	Nil	Nil	Nil	705	2,878	5,215	20,005	...	747	2,034
Perlis ...	...	35	13	9	51	2	47	Nil	Nil	Nil	Nil	11	Nil	Nil	84	...	36	12
Kelantan ...	...	60	155	153	1,109	307	1,632	62	Nil	283	Nil	74	369	347	2,585	...	148	146
Trengganu ...	...	55	50	142	825	71	414	Nil	Nil	Nil	Nil	Nil	213	Nil	1,239	...	55	50
Total Malay States	...	18,090	18,382	18,133	143,669	13,880	96,679	62	8	283	45	16,213	15,938	122,812	120,377	...	18,921	17,458
SELTENMENTS																		
Malacca ...	...	2,632	1,343	1,397	10,719	...	...	Nil	Nil	Nil	...	4,552	...	31,722	...	...	3,077	1,275
Province Wellesley	...	129	550	507	3,581	...	...	Nil	Nil	Nil	...	...	...	40,559	Nil	...	135	561
Dindings ...	...	157	91	90	750	2,244	15,438	Nil	15,947	3,201	120,493	3,839	Nil	...	...	...	223	103
Penang ...	...	1,593	2,902	13	2	18	...	243	...	3,201	...	14,723	...	123,039	...	1,591	4,542	12
Singapore ...	...	2,815	13,978	212	155	1,231	...	5,498	15,947	39,325	120,493	14,723	Nil	105,320	...	2,326	15,701	209
Total Straits Settlements	...	4,408	19,798	2,209	16,299	2,244	15,438	5,741	15,947	42,526	120,493	23,114	Nil	...	...	3,917	23,678	3,160
TOTAL MALAYA	...	4,408	37,888	20,591	20,284	159,968	161,124	112,117	5,803	15,955	42,809	39,327	15,938	318,173	120,377	3,917	23,599	19,618

TABLE II
DEALERS' STOCKS, IN DRY TONS. 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province Wellesley	Johore	Total
20	21	22	23	24	25	26
DRY RUBBER	12,287	13,827	4,175	3,235	1,323	34,847
WET RUBBER	2,691	1,874	367	200	1,634	6,766
TOTAL ...	14,978	15,701	4,542	3,435	2,957	41,613

TABLE III
FOREIGN EXPORTS

PORTS	during the month 1932
Singapore	27,400
Penang	7,957
Port Swettenham	3,378
Malacca	592
MALAYA	39,327

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	during the year 1932
Malay States	...	237,995
Straits Settlements	...	237,995
MALAYA	...	237,995

- Notes:—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, i.e., Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] + [21] + [22] + [23] + [24] + [25] + [26] + [27] + [28] + [29] + [30] + [31] + [32] + [33] + [34] + [35] + [36] + [37] + [38] + [39] + [40] + [41] + [42] + [43] + [44] + [45] + [46] + [47] + [48] + [49] + [50] + [51] + [52] + [53] + [54] + [55] + [56] + [57] + [58] + [59] + [60] + [61] + [62] + [63] + [64] + [65] + [66] + [67] + [68] + [69] + [70] + [71] + [72] + [73] + [74] + [75] + [76] + [77] + [78] + [79] + [80] + [81] + [82] + [83] + [84] + [85] + [86] + [87] + [88] + [89] + [90] + [91] + [92] + [93] + [94] + [95] + [96] + [97] + [98] + [99] + [100]. For the Straits Settlements, Columns [7] and [8] represent purchases by dealers from local estates of less than 100 acres, reduced by 15% to terms of dry rubber.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15%; wet sheet, 25%; scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.
5. The above, with certain omissions, is the Report published by W. R. Boyd, M. C. S., Registrar-General of Statistics, S.S., and F.M.S., at Singapore on 23rd September, 1932.

METEOROLOGICAL SUMMARY, MALAYA, AUGUST, 1932.

Locality	AIR TEMPERATURE IN DEGREES FAHRENHEIT					EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE						
	Means of		Mean of A and B	Absolute Extremes			At I foot	At 4 feet	Total		Most in a day		Number of days				Total	Daily Mean	Per cent	
				Highest	Lowest	Min.							Max.	Highest	Thunder-storm	Fog morning obs.				Gale force 8 or more
	A.	B.	Max.	Min.	°F	°F	°F	°F	in.	mm.	in.	mm.	Precipitation .01 in or more	Precipitation .05 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	hr.	hr.	%
	°F	°F	°F	°F	°F	°F	°F	°F	°F	mm.	in.	mm.	in.	Precipitation .01 in or more	Precipitation .05 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	hr.	hr.
Railway Hill, Kuala Lumpur, Selangor	90.9	71.4	81.1	96	69	78	73	83.4	84.6	12.05	306.1	2.37	22	20	7	4		193.20	6.23	54
Bukit Jeram, Selangor	87.9	71.9	79.9	92	70	79	74	84.3	86.3	8.54	216.9	2.28	19	14	1			209.25	6.75	55
Sitiawan, Perak	89.6	72.8	81.3	93	70	83	75	84.6	85.4	2.61	66.3	0.80	17	13	5	1		237.65	7.67	63
Kroh, Perak	86.7	69.9	78.3	90	67	81	72	82.3	82.8	13.19	335.0	2.85	23	18	2			207.25	6.69	54
Temerloh, Pahang	89.9	71.9	80.9	94	69	83	75	85.4	85.9	5.47	138.9	1.38	15	13	3	15		186.50	6.02	49
Kuala Lipis, Pahang	89.2	71.2	80.2	92	67	85	74	83.9	84.8	3.66	93.0	0.94	19	12	3	23		192.15	6.20	50
Kuala Pahang, Pahang	87.0	73.5	80.3	89	72	79	75	87.2	86.7	4.24	107.7	2.07	8	6	2			264.10	8.20	67
Mount Faber, Singapore	86.5	74.9	80.7	90	72	77	77	82.4	83.4	3.54	89.9	0.58	19	17	2			187.10	6.03	49
Butterworth, Province Wel-lesley	87.4	74.1	80.8	89	71	84	76	84.3	85.3	5.18	147.6	3.04	13	10	1	2		237.10	7.65	62
Bukit China, Malacca	84.4	73.1	78.7	87	71	79	75	82.6	83.5	5.45	138.4	2.50	18	11				207.05	6.68	55
Kluang, Johore	86.9	70.3	78.6	91	68	76	72	81.1	82.1	11.37	288.8	2.43	21	16	5	11		144.80	4.67	38
Bukit Lalang, Mersing, Johore	86.8	71.0	78.9	89	69	76	73	80.9	81.5	3.49	88.7	0.92	8	7				222.05	7.16	59
Alor Star, Kedah	87.9	73.7	80.8	90	72	84	76	86.8	86.6	6.13	155.7	2.87	15	13	10	1		251.80	8.12	66
Kota Bahru, Kelantan	89.6	73.2	81.4	92	70	86	77	85.2	85.6	4.86	123.5	1.31	10	10	1			266.50	8.60	70
Kuala Trengganu, Trengganu	89.5	71.9	80.7	91	68	87	74	84.4	85.0	2.06	52.3	1.28	4	4	1			279.70	9.02	73
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	73.1	61.8	67.5	77	59	65	64	71.3	71.9	7.25	184.2	1.65	25	22	2	7		180.30	5.82	48
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	71.6	56.8	64.2	74	53	67	62	69.4	69.4	14.27	362.5	2.82	27	24	3	11		155.45	5.01	41
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	71.0	58.9	64.9	74	57	67	61			14.76	374.9	2.75	27	24	2			163.60	5.28	43

